REVISIONE DELLA MORFOLOGIA E DELLE RELAZIONI FILOGENETICHE DEI COCCODRILLI OLIGOCENICI DI MONTEVIALE.

Giornate di Paleontologia 2018

Trento e Predazzo (5) 6-8 (9) giugno 2018

Programma e libro degli abstract

A cura di Massimo Bernardi e Riccardo Tomasoni

Società Paleontologica Italiana S. P. I.

Comune di Predazzo

Museo Geologico delle Dolomiti di Predazzo

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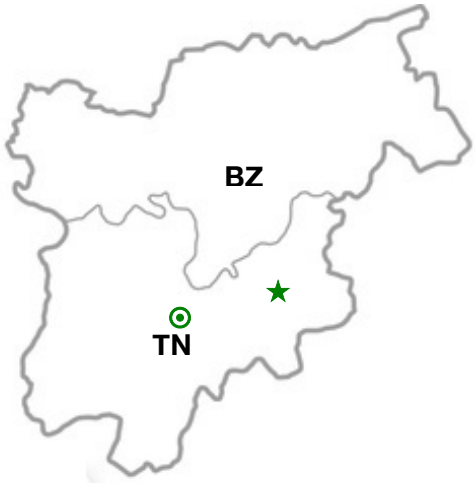
Le Giornate 2018

La XVIII Edizione delle Giornate di Paleontologia è proposta in un'inedita versione itinerante che porterà l'annuale appuntamento SPI dapprima a Trento, presso il MUSE – Museo delle Scienze, e successivamente a Predazzo (Valle di Fiemme) presso il rinnovato Museo Geologico delle Dolomiti, sezione territoriale del MUSE.

+90 Partecipanti
63 Contributi
2 sedi congressuali
1 Tavola rotonda Palaeontologist in Progress
1 Tavola rotonda sulla legislazione in materia di beni paleontologici in Italia
1 Serata di edutainment paleontologico

Le sedi congressuali



¤ **MUSE – MUSEO DELLE SCIENZE**
Corso del Lavoro e della Scienza, 3
38122 Trento

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Piazza SS. Filippo e Giacomo, 1
38037 Predazzo (TN)

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PROGRAMMA DELLE GIORNATE

5 giugno (MUSE, Trento)

dalle 14.30 VI Tavola Rotonda Palaeontologist in Progress

6 giugno (MUSE, Trento)

ore 8.00 Registrazione e affissione poster

ore 8.30 Benvenuto e saluti introduttivi

ore 8.45 Prima sessione, chair Annalisa Ferretti (UniMore)

Paleoecology of benthic foraminifera from the upper Burdigalian-lower Langhian La Vedova section (Còner o Riviera, Marche region, Italy)
Russo B., Turco E., Cascella A., Iaccarino S.M.

A cladistic approach for the systematic and phylogenetic revision of the foraminiferal family Globivalvulinidae Reitlinger, 1950
Gennari V., Cherin M., Rettori R.

The Messinian diatomaceous deposition in the Mediterranean: looking for a 'siliceous' bridge between continents and oceans
Pellegrino L., Dela Pierre F., Natalicchio M., Carnevale G.

Microbialites in cryptic environments: a geobiological process independent of time and space
Guido A., Russo F., Mastandrea A.

Back in time: modern iron ooids as a key to fossil ironstones
Di Bella M., Sabatino G., Quartieri S., **Ferretti A.**, Cavalazzi B., Barbieri R., Foucher F., Messori F., Italiano F.

ore 10.00 Pausa caffè e sessione poster

ore 10.30 Seconda sessione, chair Giorgio Carnevale (UniTo)

New tetrapod material from the Permian Torre del Porticciolo (Alghero, Italy) outcrop: taphonomy and preliminary results
Romano M., Citton P., Maganuco S., Sacchi E., Caratelli M., Ronchi A., Nicosia U.

Archosaur footprints in the ?Lower Triassic of Western Alps (Gardetta Plateau - Preit Valley, south-western Piedmont, Italy)
Furrer H., **Petti F.M.**, Collo E., Martinetto E., Piazza M.

The way it was: application of a new retrodeformation procedure to the skull of the basal theropod *Herrerasaurus ischigualastensis* (Reig, 1963)
Profico A., Buzi C., Conti J., **Bellucci L.**

New insights into marine vertebrate diversity from the Bonarelli Level of Northeastern Italy
Amalfitano J., Carnevale G., Fornaciari E., Giusberti L.

Redescription of *"Rhinobatus" dezigni*, an Eocene guitarfish from the Bolca konservat-lagerstätte, Italy
Varese M., Marramà G., Kriwet J., Carnevale G., Giusberti L.

A reappraisal of the northeastern Italy record of *Ptychodus* (Chondrichtyes, Elasmobranchii)
Amadori M., Amalfitano J., Giusberti L., Fornaciari E., Carnevale G., Kriwet J.

Revisione della morfologia e delle relazioni filogenetiche dei coccodrilli oligocenici di Monteviale
Macaluso L., Martin J.M., Del Favero L., Delfino M.

The Upper Pleistocene human and animal footprints of the Grotta della Bàsura (Toirano, Northern Italy) cave: an ongoing review.
Avanzini M., Arobba D., Benedicenti E., Caramiello R., Citton P., Clementi L.C., Firpo M., Giannotti S., Negrino F., Panizza F., Romano M., Rellini I., Salvador I., Starnini E., Zunino M.

ore 12.30 Pausa pranzo

ore 14.00 Sessione speciale, “Crisi ambientali e risposte biotiche nella storia della Terra. Una prospettiva italiana" introduce Massimo Bernardi (MUSE)

Carnian Pluvial Episode (CPE): il cambiamento climatico globale del Carnico (Triassico Superiore) e le sue implicazioni paleoecologiche e paleoevolutive
Preto N., Bernardi M., Dal Corso J., Gianolla P., Kustatscher E., **Roghi G.**

Gli Eventi Anossici Oceanici: crisi e opportunità per la biosfera marina
Erba E.

Il limite Cretacico/Paleogene: dalle prime segnalazioni alle interpretazioni attuali
Premoli Silva I.

The Paleocene-Eocene thermal maximum in Italy: the state of the art
Giusberti L., Boscolo Galazzo F.

Did the Mediterranean ever dry out? The fossil record of the Messinian salinity crisis
Carnevale G.

La Sesta Estinzione di Massa: *Homo sapiens* sarà la prima specie auto-minacciata?
Pievani T.

ore 16.00 Pausa caffè e sessione poster

ore 16.30 Terza sessione, chair Raffaele Sardella (Sapienza)

Systematics and phylogeny of the Late Miocene Rhinocerotidae from Cessaniti (Vibo Valentia, southern Italy)
Pandolfi L., Marra A.C., Carone G., Rook L.

Sus strozzii (Suidae, Mammalia) from the Early Pleistocene of Italy and a phylogenetic analysis of suines
Sorbelli L., Crotti M., Iurino D.A., Sardella R., Souron A., Cherin M.

New material of *Pseudodama nestii* (Mammalia, Cervidae) from the Early Pleistocene of Pantalla (Perugia, central Italy)
Holpin S., Breda M., Iurino D.A., Sardella R., Cherin M.

The European croassroad: early Pleistocene paleoenvironments of the Italian Peninsula
Strani F., Bellucci L., Conti J., DeMiguel D., Iurino D.A., Mecozzi B., Sardella R.

New palaeontological data on the Fontana Ranuccio site (Middle Pleistocene, central Italy)
Conti J., Bellucci L., Iurino D.A., Mecozzi B., Strani F., Terranova E., Sardella R.

Preliminary analysis of the large mammal fauna from layers G to K of Grotta Romanelli, Apulia (Southern Italy)
Mecozzi B., Bellucci L., Bona F., Cicia V., Conti J., Iannucci A., Iurino D.A., Mazzini I., Pushkina D., Sanzi R., Strani F., Sardella R.

Martellictis gen. nov. (Mammalia, Mustelidae) e la sistematica dei Galictini fossili dell’Eurasia
Bartolini Lucenti S.

Progress on the Joint Howard University, University of Florence, Smithsonian Institution Equid Project
Bernor R.L., Cirilli O., Rook L.

Pliocene stratigraphic paleobiology in Tuscany and the fossil record of marine megafauna
Dominici S., Danise S., Benvenuti M.

Ore 18.45 Chiusura lavori

Ore 20.30 Cena sociale presso il MUSE e vista alle sale espositive

Ore 23.00 Fine evento

7 giugno (escursione *Ecosistemi terrestri tra il Permiano e il Triassico in Dolomiti*)

ore 7.45 Ritrovo presso il MUSE

ore 8.00 Partenza in autobus

ore 9.00 Arrivo a Termeno e breve escursione presso un affioramento del limite Permiano-Triassico

ore 11.30 Ripartenza in direzione Geoparc Bletterbach

ore 12.30 Pausa pranzo presso il Centro visite del Geoparc Bletterbach

ore 13.15 Escursione nella gola del Bletterbach (3 ore, 200 metri di dislivello su sentieri di montagna, si raccomanda vestiario e scarpe adeguate)

ore 16.15 Ripartenza verso Predazzo

ore 17.30 Visita al Museo Geologico delle Dolomiti di Predazzo

ore 19.15 Raggiungimento dell'Hotel Bellaria (Predazzo)

ore 20.00 Cena e pernotto

8 giugno (Museo Geologico delle Dolomiti, Predazzo)

ore 8.30 Saluti introduttivi

ore 8.45 Quarta sessione, chair Lucia Angiolini (UniMi)

First record of sabellids and serpulids (Polychaeta Sabellida) from the Permian of western Sicily
Sanfilippo R., Rosso A., Reitano A., Insacco G.

Invertebrate trace fossils from the Cisuralian continental basins of the Southern Alps (Italy)
Marchetti L., Bernardi M., Santi G., Ronchi A.

Le macrofaune bentoniche della sezione di Seres/Mischi in Val Badia nel contesto dell'estinzione Permiano-Triassica
Prinoth H.

Variation in brachiopod microstructure under low pH - ocean acidification - conditions
Ye F., Angiolini L., Crippa G., Henkel D., Jurikova H., Brand U.

Biomineralization and agglutination in the carrier shell *Xenophora crispa* (König, 1825)
Crippa G., Pasinetti G., Dapiaggi M., Angiolini A.

Pliocene oysters from Valle Botto area (NW Italy): the least studied of the quarry, but very useful among molluscs in taxonomy, paleoecology and morphometrical analyses
De Bortoli L., Martinetto E., Hiadilová Š

The occurrence of fossil and living *Cytherissa lacustris* (G. O. Sars 1863) in Italy
Mazzini I.

ore 10.30 Pausa caffè

ore 11.00 Quinta sessione, chair Guido Roghi (CNR Padova)

La flora del Permiano inferiore (Kunguriano) di Tregiovo (Val di Non, Trento): uno studio paleobotanico e geochimico
Forte G., Kustatscher E., Roghi G., Preto N.

Disentagling late Permian conifer leaf cuticles: quantitative analysis of epidermal characters and taxonomic consequences.
Hartman J.D., Duijnstee I.A.P., **Kustatscher E.**, van Konijnenburg-van Cittert J.H.A., Looy C.V.

What happened to land plants during the end-Permian mass extinction?
Nowak H., Kustatscher E.

ore 11.45 Sesta sessione, chair Lorenzo Rook (UniFi)

Managing all fossils: sustainability for Italian society and contribution of new information technologies
Martinetto E., Caruso C., Di Silvestro G., Famiani F., Quarantelli M.

The Italian cultural heritage law and its impact on paleontology in Italy
Orso J.

ore 12.15 Pausa pranzo

ore 13.15 Assemblea sociale

ore 15.00 Fine lavori e ripartenza in pullman verso Trento

ore 17.00 Arrivo a Trento con stop presso la stazione dei treni e il MUSE

a seguire: **Paleonight** (MUSE, Trento)

Programma di edutainment a tema paleontologico nelle sale espositive del MUSE e nel parco antistante.

9 giugno (MUSE, Trento)

ore 11.00 Saluti introduttivi

ore 11.15 Tavola rotonda “Legislazione in materia di beni paleontologici in Italia”.
Introduce e modera Lorenzo Rook (Presidente Società Paleontologica Italiana). Intervengono:

Valeria Acconcia (Funzionaria MiBACT - Istituto Centrale per l’Archeologia)

Andrea Pessina (Soprintendente MiBACT - Soprintendenza Archeologia, Belle Arti e Paesaggio per la Città Metropolitana di Firenze e le Province di Pistoia e Prato)

Ursula Wirer (Funzionaria MiBACT - Soprintendenza Archeologia, Belle Arti e Paesaggio per la Città Metropolitana di Firenze e le Province di Pistoia e Prato)

Maria Adelaide Rossi (Funzionaria MiBACT - Soprintendenza Archeologia, Belle Arti e Paesaggio dell’Abruzzo)

Lorenzo Pella (Comandante Nucleo Carabinieri Tutela Patrimonio Culturale)

Alfio Viganò (Funzionario Servizio Geologico della Provincia Autonoma di Trento)

Manuela Lugli (Avvocato, Revisore dei Conti Società Paleontologica Italiana)

Michele Quarantelli (rappresentate gruppo Fossili Italiani)

ore 13.15 Chiusura dei lavori

ABSTRACT DEI CONTRIBUTI ORALI

Prima sessione, chair Annalisa Ferretti (Università degli Studi di Modena e Reggio Emilia)

PALEOECOLOGY OF BENTHIC FORAMINIFERA FROM THE UPPER BURDIGALIAN-LOWER LANGHIAN LA VEDOVA SECTION (CÒNERO RIVIERA, MARCHE REGION, ITALY)

Russo B.[1], Turco E.[2], Cascella A.[3], Iaccarino S.M.[2]

[1] Dipartimento di Scienze della Terra, dell'Ambiente e delle Risorse Università di Napoli "Federico II", Complesso universitario di Monte Sant'Angelo (Edificio L), Via Cinthia 21, 80126 Napoli (Italy);
[2] Dipartimento di Scienze Chimiche, della Vita e Sostenibilità Ambientale, Università di Parma, Parco Area delle Scienze 157/A, 43124 Parma (Italy);
[3] INGV, Via della Faggiola 32, 56126 Pisa (Italy).

A quantitative and statistical analysis on benthic foraminifera from the upper Burdigalian-lower Langhian astronomically-tuned La Vedova composite-section cropping out along the Adriatic coast (Cònero Riviera, Marche region, Italy) is presented. The benthic foraminiferal assemblages indicate a middle bathyal paleodepositional depth. A remarkable change in the distribution patterns of the species is recorded at 37 m highlighting two intervals: 0–37 m and 37–63 m. The transition between these two intervals occurs at the top of Megabed interval and is almost coincident with the paracme beginning (PB) of *Sphenolithus heteromorphus*, located at 36.27 m and astronomically dated at 15.74 Ma. The benthic foraminiferal assemblages of the lower interval (16.3 Ma–15.74 Ma), mainly represented by *Bolivina lata*, *B. spathulata*, *Globocassidulina subglobosa*, *Oridorsalis umbonatus*, *Pullenia bulloides*, and *Uvigerina semiornata/U. striatissima*, indicate dysoxic/suboxic conditions during the deposition of the Megabeds, and a relatively high primary productivity with an influx of organic matter at the sea floor. The benthic foraminiferal assemblages of the upper interval (15.74 Ma–15.3 Ma), mainly represented by *Siphonina reticulata* together with *B. reticulata*, *Cibicidoides cicatricosus*, *C. dutemplei/subhaidingerii* suggest a relative decrease of primary productivity and an overall amelioration of the environmental bottom conditions, which became oxic. The presence of several peaks of *Cassidulina laevigata* together with the discontinuous occurrences of B. spathulata and G. subglobosa as well as the reduction of *O. umbonatus* and *P. bulloides* indicate pulses of relatively warm and less salty bottom water masses with respect to the lower interval. The observed changes in the benthic foraminiferal assemblages at 15.7 Ma may reflect variations of the sea bottom conditions related to the end of the Middle Miocene Climatic Optimum and/or to the Mediterranean Langhian transgression.

A CLADISTIC APPROACH FOR THE SYSTEMATIC AND PHYLOGENETIC REVISION OF THE FORAMINIFERAL FAMILY GLOBIVALVULINIDAE REITLINGER, 1950

Gennari V., Cherin M., Rettori R.

Dipartimento di Fisica e Geologia, Università degli Studi di Perugia, Via A. Pascoli, 06123 Perugia, Italy.

In the present study, we propose a systematic revision of the Carboniferous to Permian family Globivalvulinidae (Globivalvulinoidea), based on a morphological/structural approach (traditionally used for this fossil group) and a phylogenetic analysis based on, for the first time, a cladistic investigation (not commonly applied on Paleozoic Foraminifera). In our systematic review, we support the validity of the four subfamilies of Globivalvulinidae (Globivalvulininae, Paraglobivalvulininae, Dagmaritinae, and Paradagmaritinae), but we partially emend their taxonomic composition. The phylogenetic analysis of the Globivalvulinidae is aimed at understanding and reconstructing the relationships between these subfamilies. The resulting cladogram is obtained by means of fourteen qualitative and one quantitative characters. The analysis shows that the Globivalvulinidae represents a monophyletic clade having the subfamily Dagmaritinae as the first taxon to branch out. The close affinity between Globivalvulininae and Paraglobivalvulininae is also confirmed. Finally, we propose some interpretations to explain the derivate position of Globivalvulininae in the phylogenetic tree with respect to the other subfamilies, which apparently contrasts with the stratigraphic distributions of these taxa.

THE MESSINIAN DIATOMACEOUS DEPOSITION IN THE MEDITERRANEAN: LOOKING FOR A 'SILICEOUS' BRIDGE BETWEEN CONTINENTS AND OCEANS

Pellegrino L., Dela Pierre F., Natalicchio M., Carnevale G.

Università degli Studi di Torino, Dipartimento di Scienze della Terra.

During the latest Miocene, Mediterranean marginal basins experienced a significant increase of the opaline production that reached its acme at about 7-6 Ma. This event was unanimously considered as the first expression of the ongoing restriction of the Atlantic connection, ultimately leading to the so called Messinian Salinity Crisis. Even if regional paleoceanographic processes certainly played a role in the modulation of the Mediterranean 'opal burst', a broader perspective may provide new, neglected insights into this singular sedimentary event.
A marked intensification of the diatomaceous deposition, coeval to the Mediterranean 'opal burst' and attributable to the so called 'late Miocene-early Pliocene biogenic bloom', has been globally recorded by recent paleoceanographic investigations, hinting at a connection between these events.
Diatoms are silica-sequestering organisms, therefore the role played by a possible intensification of the biogeochemical cycle of silica during the Late Neogene represents a crucial landmark and must be more carefully studied.
We evaluate, under a silica-perspective, the continental reconfigurations involving the geobiosphere during the latest Miocene, suggesting how the expansion of open environments and the reinforcement of tectonic activity may have promoted a strong release of silica readily exploitable by diatoms, both at Mediterranean and global scale.

MICROBIALITES IN CRYPTIC ENVIRONMENTS: A GEOBIOLOGICAL PROCESS INDEPENDENT OF TIME AND SPACE

Guido A., Russo F., Mastandrea A.

Dipartimento di Biologia, Ecologia e Scienze della Terra, Università della Calabria, Via Bucci, cubo 15b, 87036 Rende, Cosenza, Italy.

Marine microbialites are common structures in cryptic niches of reef complexes. They were described in different sedimentary environments, from the Great Barrier Reef to deep water in the Red Sea. Recent microbial product can provide key insights into fossil ecosystems, and the Mediterranean submarine caves hold one of the best examples for studying microbialites in cryptic environments and comparing with their fossil counterparts. Here we compare small bioconstructions, the biostalactites from submarine caves of Sicily and Cyprus, with the Carnian patch reefs of Dolomites (Heiligkreuz Formation, Alpe di Specie). Complex biotic relationships among skeletal organisms (manly serpulids) and microbial communities produce bioconstructions in marine caves. The microbial-induced biomineralization is the consequence of autotrophic and chemoheterotrophic bacterial activities. Sulfate Reducing Bacteria (SRB), fed by the organic matter produced by metazoans, flourish in millimetric suboxic cavities of the skeletal framework, and induce autochthonous micrite deposition and the biostalactite early stabilization. Similar processes induced the deposition of the small Upper Triassic patch reefs of the Dolomites, which developed in quite shallow water. They are made up mainly by scleractinian corals, sponges and red algae, and contain millimeter to centimeter size framework cavities that represent flawless niches for microbial development. SRB biomarkers and REE values of the Carnian patch reefs, revealing suboxic conditions, indicate a deposition of the microbialites in protected low-oxygen micro-habitats. The presence of very similar signature both in the microbialites of recent submerged marine caves and Carnian patch reefs testifies that microbial mediated precipitation in cryptic environments is a geobiological process independent of time and space.

BACK IN TIME: MODERN IRON OOIDS AS A KEY TO FOSSIL IRONSTONES

Di Bella M.[1,2], Sabatino G.[2,3], Quartieri S.[3], **Ferretti A.**[4], Cavalazzi B.[5,6], Barbieri R.[5], Foucher F.[7], Messori F.[4], Italiano F.[1]

[1] National Institute of Geophysics and Volcanology (INGV), Palermo Section, Via Ugo La Malfa 153, I-90146 Palermo Section, Italy;
[2] Department of Mathematics, Computer, Physics and Earth Sciences (MIFT), University of Messina, Viale Ferdinando Stagno d'Alcontres 31, I-98166 S. Agata, Messina, Italy;
[3] Centro di Eccellenza Ricerca e Innovazione Strutture e Infrastrutture di grandi dimensioni (CERISI), University of Messina, Viale Ferdinando Stagno d'Alcontres 31, I-98166 S. Agata, Messina, Italy;
[4] Department of Chemical and Geological Sciences (DSCG), University of Modena and Reggio Emilia, Via Campi 103, I-41125 Modena, Italy;
[5] Department of Biological, Geological and Environmental Sciences (BiGeA), University of Bologna, Via Zamboni 67, I-40126 Bologna, Italy;
[6] Department of Geology, University of Johannesburg, PO Box 524 Auckland Park 2006, Johannesburg, South Africa;
[7] Centre de Biophysique Moléculaire (CBM), Rue Charles Sadron, F-45071 Orléans Cedex 2, France.

Iron ooids have been an important component of the sedimentary record since Precambrian times, but extremely rare occurrences are reported nowadays in modern settings. The origin and the genesis of iron ooids and oolitic ironstones, and their extensive distribution, have long been a matter of debate and controversy and a satisfactory and unequivocal model for their origin has yet to be developed. Modern occurrences of iron ooids are extremely rare. Here we report an exceptional Recent iron ooid deposit from an intertidal to shallow-shelf environment along Panarea Island, in the SE Tyrrhenian Sea, Italy. Constraining origin and genetic environment of modern iron ooids is fundamental for the interpretation of the fossil counterpart. The deposit reported herein occurs as loose spheroidal grains in an area influenced by intense hydrothermal activity. An integrated morphological/textural, compositional, geobiological and mineralogical characterization was performed. The results show that iron ooids are not diagenetic, not reworked and show features perfectly matching ancient occurrences. Panarea ooids deposited concentric laminae of primary goethite around nuclei already existing on the seafloor. The process was abiotic, rapid and ruled by hydrothermal fluids, directly acting as iron source. The spherical laminated structure resulted from constant agitation by degassing of CO2-dominated fluids through the seafloor sediments.

Seconda sessione, chair Giorgio Carnevale (Università degli Studi di Torino)

NEW TETRAPOD MATERIAL FROM THE PERMIAN TORRE DEL PORTICCIOLO (ALGHERO, ITALY) OUTCROP: TAPHOMOMY AND PRELIMINARY RESULTS

Romano M.[1,2], Citton P.[2,3], Maganuco S.[4], Sacchi E.[2], Caratelli M.[3], Ronchi A.[5], Nicosia U.[2]

[1] Evolutionary Studies Institute, School of Geosciences, University of the Witwatersrand, Johannesburg, South Africa;
[2] Dipartimento di Scienze della Terra, Sapienza Università di Roma, Piazzale A. Moro 5, 00185, Rome, Italy;
[3] CONICET - Instituto de Investigación en Paleobiología y Geología, Universidad Nacional de Río Negro, Av. Roca 1242 (8332), General Roca, Río Negro province, Argentina;
[4] Museo di Storia Naturale di Milano, Corso Venezia 55, 20121 Milano, Italy;
[5] Dipartimento di Scienze della Terra e dell'Ambiente, Università di Pavia, v. Ferrata 1, 27100 Pavia, Italy.

In this contribution we present a new productive site discovered at Torre del Porticciolo fossil locality (NW Sardinia, Alghero, Italy). The site is close to the outcrop yielding the first osteological material of a basal (i.e., non-mammalian) synapsid in Italy, the giant herbivore caseid *Alierasaurus ronchii* which, although known from fragmentary remains, represents to date the largest known late Early to early Middle Permian synapsid (6–7 m total length). The new fossiliferous outcrop is about one 70-80 meters from the *Alierasaurus* type locality, but roughly at the same stratigraphic level. Given the fragmentary nature of most of the recovered bones (some found broken and totally isolated within the embedding sediments) we conduct a detailed taphonomical analysis in order to define the kind of burial, the type of finding, and the mode of preservation. The analysis highlighted a complex taphonomical process involving a multiphase entombment: i) after death, the body remained for a short time on a floodplain surface not far from the channel levee and was rapidly buried; ii) the bones were subject to an early diagenesis with the disappearance of collagen and permineralization; iii) a strong energetic current exhumed the remains in a later flooding event, carrying the material to a site quiet and close enough, where the new sedimentary body has been deposed, along with the bones showing breakage scattered in the sediment. This final entombment site could be envisaged as a semi-perennial pond or and an oxbow lake in the frame of the meander belt system. Preliminary analysis allowed to refer the new material to a large faunivorous basal synapsid within the family Sphenacodontidae. This discovery represents the first carnivorous non-therapsids synapsid from the Permian of Italy and one of only a few known from Europe.

ARCHOSAUR FOOTPRINTS IN THE ?LOWER TRIASSIC OF WESTERN ALPS (GARDETTA PLATEAU - PREIT VALLEY, SOUTH-WESTERN PIEDMONT, ITALY)

Furrer H.[1], **Petti F.M.**[2], Collo E.[3], Martinetto E.[4], Piazza M.[5]

[1] Paläontologisches Institut und Museum, Universität Zürich, Karl Schmid-Strasse 4, CH-8006 Zurich;
[2] Muse – Museo delle Scienze di Trento, Corso del Lavoro e della Scienza 3, I-38122 Trento;
[3] Natura Occitana, via Copetta 16, I-12025 Dronero (CN);
[4] Dipartimento di Scienze della Terra, Università degli Studi di Torino, Via Valperga Caluso 35, I-10125 Torino;
[5] Dipartimento di Scienze della Terra, dell'Ambiente e della Vita, Università di Genova, Corso Europa 26 - I-16132 Genova.

A new tetrapod tracksite was found in the Lower Triassic siliciclastic deposits of the Briançonnais units, cropping out between the Gardetta Plateau and Preit glacial valley (Western Alps, Piedmont, NW Italy).
Tracks are preserved as concave epirelief on a steep bedding plane belonging to the "semelle silicieuse" of the Pianezza stratigraphic section (Sautron Tectonic Unit). The “semelle silicieuse” rests on volcanic rocks dated to the upper Carboniferous-Permian interval and is composed by coarse-grained quartz-conglomerates, quartz-arenites and quartz-siltites. They are usually referred to the Upper Permian-Lower Triassic interval for their stratigraphic position, being upwardly bounded by the “lower cargneule complex”, generally dated to the lower Anisian. The track-bearing layer is made up of cross-bedded quartz-arenites and quartz-siltstones with ripple marks, that record a fluvial to mudflat depositional environments. Although the absence of reliable biostratigraphic constraints does not allow an accurate chronological attribution, the above discussed data point towards a possible attribution to the late Olenekian.
Some of the tracks belong to two distinct trackways and were tentatively assigned to the ichnogenus *Chirotherium* Kaup, 1835.
An exceptionally preserved manus-pes set, assigned to *Isochirotherium* Haubold, 1971, was discovered in 2017. Additionally, some other few footprints were collected from loose sandstone slabs.
The Gardetta ichnoassemblage represents the first well-documented evidence of Early Triassic terrestrial tetrapods in the Briançonnais Domain and well correlates with the *Chirotherium barthii* biochron II (late Olenekian–Anisian).
The discovered ichnoassemblage partially confirms the age derived by stratigraphic correlation with other sections in the Briançonnais of the Western Alps but further analyses will necessarily have to be carried out to constrain the age of the track-bearing level.
Finally, footprint morphology and trackway pattern suggest Triassic archosauriforms as suitable trackmakers. The Gardetta ichnoassemblage can thus also provide further data to understand the evolutionary and biogeographical patterns of this group of reptiles during the Early Triassic period.

THE WAY IT WAS: APPLICATION OF A NEW RETRODEFORMATION PROCEDURE TO THE SKULL OF THE BASAL THEROPOD *HERRERASAURUS ISCHIGUALASTENSIS* (REIG, 1963)

Profico A.[1], Buzi C.[1], Conti J.[2], **Bellucci L.**[3]

[1] Dipartimento di Biologia Ambientale, Sapienza Università di Roma, P.le Aldo Moro 5, 00185 Roma, Italy;
[2] Dipartimento di Scienze della Terra, Sapienza Università di Roma, P.le Aldo Moro 5, 00185 Roma, Italy;
[3] Polo museale, Sapienza Università di Roma, P.le Aldo Moro 5, 00185 Roma, Italy.

The study of lifeforms from the past and of fossil in general is benefiting, since several decades, of a rapid development of digital technologies and methods, aimed at the improvement of both quality and quantity of the data extractable from a single specimen. The digital acquisition, via computerized tomography, laser scanner or photogrammetry, allows to study thoroughly, and often with high detail, fragile and unique specimens with any contact and thus any risk of deterioration. The virtual models produced with such methodologies revealed to be, at the same time, an indispensable mean for the reconstruction of the original shape of specimens often damaged or deformed by the taphonomic processes. In this work, we present the digital retrodeformation of the skull of the basal theropod *Herrerasaurus ischigualastensis* (Late Triassic) from the Ischigualasto Formation (Northwestern Argentina). The skull is strongly deformed (torsion and antero-posterior bending) and bear both the mandible and some sediment bound to the cranium. Our reconstruction was carried out on a computerized tomography restitution of the specimen, by applying a recently proposed method of retrodeformation, developed in R environment, which symmetrize bilateral objects thanks to the definition of bilateral sets of landmark, curves and semi-landmarks. The retrodeformation performed with these method results coherent with the conventional, morphological-based reconstructions and bear a significant potential in terms of education, dissemination and research activities.

NEW INSIGHTS INTO MARINE VERTEBRATE DIVERSITY FROM THE BONARELLI LEVEL OF NORTHEASTERN ITALY

Amalfitano J.[1], Carnevale G.[2], Fornaciari E.[1], Giusberti L.[1]

[1] Dipartimento di Geoscienze, Università degli Studi di Padova, via Gradenigo 6, I-35131 Padova;
[2] Dipartimento di Scienze della Terra, Università degli Studi di Torino, via Valperga Caluso 35. I-10125 Torino.

The upper Cenomanian Bonarelli Level is a radiolarian-ichthyolithic black shale horizon deposited during the OAE2 and has been recognized in different settings throughout Italy. This marker bed in NE Italy is well-known for its marine vertebrate (particularly bony fishes) and plants remains (e.g., Sorbini, 1976, Gomez et al., 2015). The most important productive sites that were object of intensive paleontological excavations are those of Bomba quarry in Cinto Euganeo on Euganei Hills (Padova province), Carcoselle quarry in Possagno (Treviso province) and the Schio Valdagno Pass (Vicenza province). The excavation activities in these sites took place during the second half of the 20th century. Previously, only scattered findings were reported during the 19th century from the surroundings of Crespano del Grappa (Vicenza province; Bassani 1880, 1882) and from Crespadoro di Altissimo (Vicenza province), with a single specimen reported by De Zigno (1883). The Bomba quarry assemblage is the only one so far described (Sorbini, 1976), but it is currently under revision along with the material coming from other localities of Veneto region.
Herein we report new updates from this ongoing revision: we examined more than 100 specimens, consisting of bony fishes fragmentary remains and isolated teeth of chondrichthyans, and we recognized at least three new taxa previously not reported, with particular regard to a possible new genus of "long-snouted" bony fish. We also provided emendations of previously misidentified specimens and nomenclature updating of previously described taxa.
The analysis of the whole assemblage provides new data about the composition of the ichthyofauna, which includes mainly pelagic predatory teleosts and a few rare chondrichthyans, and can be compared to coeval assemblages, showing affinities with the Moroccan (Jebel Tsalfat) and English Chalk faunas. These data may have relevant implications regarding the paleobiogeography of late Cenomanian ichthyofaunas.

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REDESCRIPTION OF *"RHINOBATUS" DEZIGNI*, AN EOCENE GUITARFISH FROM THE BOLCA *KONSERVAT-LAGERSTÄTTE*, ITALY

Varese M.[1],Marramà G.[2], Kriwet J.[2], Carnevale G.[3], Giusberti L.[1]

[1] Dipartimento di Geoscienze, Università degli studi di Padova,via Giovanni Gradenigo 6, 35131 Padova;
[2] Department of Palaeontology, University of Vienna, Althanstrasse 14, 1090, Vienna;
[3] Dipartimento di Scienze della Terra, Università degli studi di Torino, via Valperga Caluso 35, 10125, Torino.

The order Rhinopristiformes is a well-diversified group within the Batoidea that includes guitarfishes and sawfishes with about 60 species arranged in 12 genera. Guitarfishes are world-wide distributed and are found in continental and insular shelves from coastal to abyssal depths in warm to temperate waters. The representatives of this group probably appeared in the Toarcian (Early Jurassic) and their fossil record is mainly represented by isolated teeth and rare complete and articulated specimens coming from Mesozoic deposits. The only complete and articulated specimens of Cenozoic guitarfishes known so far are represented by *"Rhinobatus" dezigni* and "*R." primaevus*, from the upper Ypresian Bolca *Konservat-Lagerstätte*. Here we present a detailed analysis of the holotype of "*Rhinobatus*" *dezigni*, originally referred to the genus *Trygonorhina* and later assigned to *Rhinobatus.* Our study of the specimen, preserved as part and counterpart, includs direct observations of the anatomical parts, including those exclusively observable using the UV technique. The specimen preserves elements useful for its identification, including the chondrocranium, parts of the jaws, elements of hyoid and gill arches, part of the pectoral and pelvic girldles, as well as the synarcual and vertebral column. Most of the characters observed in "*Rhinobatus*" *dezigni* confirm its attribution to the order Rhinopristiformes. Morever, *"R." dezigni* shares some characters with living genera belonging to Rhinidae, Trygonorrhinidae and Rhinobatidae that support its affinities to extant guitarfishes.
Ongoing studies based on analysis of tooth and dermal denticle morphologies will allow to better understand whether the species "*R." dezigni* actually belongs to one of the genera previously described or it represents a new genus. A detailed morphological and phylogenetic analyses of the guitarfishes from Bolca will represent a considerable advancement for the understanding of the early Paleogene diversification of this group.

A REAPPRAISAL OF THE NORTHEASTERN ITALY RECORD OF *PTYCHODUS* (CHONDRICHTYES, ELASMOBRANCHII)

Amadori M.[1], Amalfitano J.[2], Giusberti L.[2], Fornaciari E.[2], Carnevale G.[3], Kriwet J.[4]

[1] Via Pilone 91/A, I-61030 Lucrezia di Cartoceto (PU);
[2] Department of Geosciences, University of Padova, Via Gradenigo 6, I-35131 Padova;
[3] Department of Earth Sciences, University of Torino, Via Valperga Caluso 35, I-10125 Torino;
[4] Department of Palaeontology, Geozentrum, University of Vienna, Althanstraβe 14, 1090 Vienna, Austria.

Ptychodus was a Late Cretaceous chondrichthyan, characterized by grinding teeth arranged in mandibular and maxillary dental plates (Cappetta, 2012; Shimada, 2012). These teeth have polygonal contours and variously developed triturating crowns (Cappetta, 2012). Usually, isolated teeth are found, whereas associated and articulated tooth sets are rare. Since the first studies, there was a great confusion about the systematic position of this genus (Brignon, 2015). The first Italian *Ptychodus* report is by Tommaso Antonio Catullo in 1818, who later figured a specimen recovered from Castellavazzo, near Belluno (Catullo, 1820). Almost a century after Catullo's works, Geremia D'Erasmo (1922) recognized eight species of *Ptychodus* as part of a review paper about fossil fishes of northeastern Italy. Since then, the studies about *Ptychodus* remains found in Veneto region were neglected despite new relevant specimens have been recovered during the second half of the 20th century, but never described.
Herein, we report the results of an extensive revision of the specimens coming from the upper Cenomanian Bonarelli Level and the Turonian-Maastrichtian Scaglia Rossa Formation, outcropping in the Veneto Region. More than hundred isolated, associated and articulated *Ptychodus* specimens were studied and seven species have been recognized: *Ptychodus altior*, *P. decurrens*, *P. latissimus*, *P. mammillaris*, *P. mortoni*, *P. polygyrus* and *P. rugosus*. We also present a preliminary analysis on microwear patterns of *Ptychodus* dental crown, performed using the Environmental Scanning Electron Microscopy and the Laser Scanning Confocal Microscopy. Our goal is the re-evaluation and description of the historical and new specimens, focusing on their morphology and nomenclatural problems, with the aim to improve our knowledge on the Italian *Ptychodus* and to provide new valuable insights about the morphological variability within the genus.

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REVISIONE DELLA MORFOLOGIA E DELLE RELAZIONI FILOGENETICHE DEI COCCODRILLI OLIGOCENICI DI MONTEVIALE

Macaluso L.[1], Martin J.M.[2], Del Favero L.[3], Delfino M.[1,4]

[1] Dipartimento di Scienze della Terra, Università degli Studi di Torino, Via Valperga Caluso 35, 10125 Torino;
[2] Laboratoire de Géologie de Lyon: Terre, Planètes, Environnement, UMR CNRS 5276, Université Lyon 1, Boulevard du 11 Novembre 1918, F-69622 Villeurbanne cedex, France;
[3] Museo di Geologia e Paleontologia, Centro di Ateneo pr i Musei, via Giotto 1, 35121, Padova;
[4] Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici Z (ICTA-ICP), Carrer de les Columnes s/n, Campus de la UAB, E-08193 Cerdanyola del Valles, Barcelona, Spain.

Due differenti generi di coccodrilli (*Asiatosuchus* e *Diplocynodon*) sono stati in passato identificati nella località oligocenica di Monteviale (VI), ma recentemente, tutti gli esemplari provenienti da questa località sono stati raggruppati nel genere *Diplocynodon*, e tentativamente assegnati alla specie *Diplocynodon ratelii*. Lo scopo del presente lavoro è descrivere in maniera esaustiva il materiale di Monteviale, ospitato nei musei di Padova, La Rochelle (Francia), e Basilea (Svizzera). La provenienza del materiale degli ultimi due musei è stata accertata tramite l'analisi del rapporto degli isotopi dello Stronzio ($^{87}Sr/^{86}Sr$). I resti di Monteviale sono numerosi, ma fortemente compressi e spesso coperti da vernici che rendono difficile l'individuazione di molti caratteri importanti per l'identificazione. Nonostante ciò, tutto il materiale può essere senza dubbio assegnato al genere *Diplocynodon*, grazie alla presenza degli osteodermi ventrali bipartiti e degli alveoli IV e V del mascellare e III e IV del dentale subeguali e confluenti. Al tempo stesso, differisce da *D. ratelii*, poiché gli elementi nasali non raggiungono le narici. Sebbene non tutti i caratteri di rilevanza filogenetica siano valutabili e quindi il *coding* di Monteviale risulti molto incompleto, anche l'analisi filogenetica (realizzata con TNT sulla base di una matrice ampiamente utilizzata negli studi precedenti) permette di escludere l'appartenenza di questi esemplari alla specie sopra citata, trovandosi essi in una politomia con due specie dell'Eocene e dell'Oligocene della Spagna, *D. tormis* e *D. muelleri*. Non è possibile individuare i caratteri diagnostici specifici di queste specie e, pertanto, l'attribuzione specifica non è possibile.

THE LATE PLEISTOCENE HUMAN AND ANIMAL FOOTPRINTS OF THE GROTTA DELLA BÀSURA (TOIRANO, NORTHERN ITALY) CAVE: AN ONGOING REVIEW

Avanzini M.[1], Romano M.[2], Citton P.[3], Salvador I.[1], Arobba D.[4], Caramiello R.[4], Firpo M.[5], Rellini I.[5], Negrino F.[6], Clementi L.[6], Zunino M.[7], Giannotti S.[7], Starnini E.[8]

[1] MUSE, Museo delle Scienze, Corso del Lavoro e della Scienza 3, 38122 Trento,
[2] Evolutionary Studies Institute (ESI), School of Geosciences, University of the Witwatersrand, 1 Jan Smuts Avenue, Braamfontein 2000, Johannesburg, South Africa;
[3] Instituto de Investigación en Paleobiología y Geología, Universidad Nacional de Río Negro, Av. Roca 1242 (8332), General Roca, Río Negro province, Argentina;
[4] Museo Archeologico del Finale, Chiostri di Santa Caterina - 17024, Finale Ligure Borgo (Savona);
[5] Dipartimento di Scienze della Terra, dell'Ambiente e della Vita (DISTAV), Università degli Studi di Genova, Corso Europa 26 – 16132, Genova;
[6] Dipartimento di Antichità, Filosofia, Storia (DAFIST), Università degli Studi di Genova, via Balbi, 2 - 16126, Genova;
[7] Grotte di Toirano, via Alle grotte, 17055, Toirano (Savona);
[8] Dipartimento di Civiltà e Forme del Sapere, Università di Pisa, via dei Mille 19, I-56126 Pisa;
[9] Soprintendenza Archeologia Belle arti e Paesaggio of Liguria, Via Balbi, 10 – 16126 Genova.

The Cave of Bàsura (Grotta della Bàsura) opens at 186 m above sea level (a.s.l.), at the foot of Mount Carmo in Loano (Toirano, Savona). The discovery of the inner rooms of the cave represented one of the most spectacular events of the Italian prehistoric research of the fifties of the twentieth century. The paleontological value of the cave was revealed by Virginia Chiappella (1952) that identified several remains of Ursus spelaeus and traces of human frequentation (footprints, carbons, digital tracks, lumps of clay adhering to the walls).
In 2014, the "Soprintendenza Archeologia Belle Arti e Paesaggio per la Città Metropolitana di Genova e le province di Imperia, La Spezia e Savona – Genova", started a new multidisciplinary project in the cave.
About thirty footprints of human trackmakers, which around 12,300 years B.P. attended the inner room of the cave, were studied by standard ichnological analysis. The best-preserved tracks were later dealt through morpho-classificatory and morphometric approaches to get an estimate of the minimum number of trackmakers. Biometric measurements were used to tentatively determine their physical characteristics (e.g., height and age), and indicated at least three different individuals, two youths and the third of tender age.
The presence of young individuals in a cave frequented in the Upper Palaeolithic, although evocative and surprising, is not an isolated case. The footprints from the 'Sala dei Misteri' confirm that, despite their apparent elusiveness in prehistoric archaeological contexts, children were an important demographic component in the Palaeolithic and that they were ubiquitous in daily life of the Pleistocene populations.
At the methodological level, the use of the forensic anthropology landmarks highlighted the high potential offered by the integrated adoption of classical ichnological analysis, morphometric analysis and three-dimensional modeling of hard-studying objects due to troublesome contexts as the caves are.

Sessione speciale

“Crisi ambientali e risposte biotiche nella storia della Terra. Una prospettiva italiana", introduce Massimo Bernardi (MUSE)

CARNIAN PLUVIAL EPISODE (CPE): IL CAMBIAMENTO CLIMATICO GLOBALE DEL CARNICO (TRIASSICO SUPERIORE) E LE SUE IMPLICAZIONI PALEOECOLOGICHE E PALEOEVOLUTIVE

Preto N.[1], Bernardi M.[2], Dal Corso J.[3], Gianolla P.[4], Kustatscher E.[5], **Roghi G.**[6]

[1] Dipartimento di Geoscienze, Università di Padova, Via Gradenigo, 6, I-35131 Padova, Italy;
[2] MUSE – Museo delle Scienze, 38122 Trento, Italy;
[3] School of Earth and Environment, University of Leeds, Leeds, LS2 9JT, UK;
[4] Dipartimento di Fisica e Scienze della Terra, Università di Ferrara, 44100 Ferrara, Italy;
[5] Museum of Nature of South Tyrol, 39100 Bozen/Bolzano (BZ), Italy;
[6] Istituto di Geoscienze e Georisorse, CNR, Via Gradenigo 6, I-35131 Padova, Italy.

Recentemente, studi paleoclimatologici, stratigrafici, geochimici, di sedimentologia dei carbonati e paleontologici hanno rivelato che durante il Carnico inferiore (Triassico Superiore, ca. 232 milioni d'anni fa) la Terra ha vissuto una variazione globale del clima da arido ad umido, denominata Evento Pluviale Carnico (CPE). L'inizio del CPE, testimoniato da un improvviso cambiamento di facies nel record stratigrafico globale, è marcato da una perturbazione del ciclo del carbonio e da un aumento della temperatura, che probabilmente sono conseguenza dell'introduzione in atmosfera d'ingenti quantità di CO_2 in relazione all'eruzione di una grande provincia magmatica (Wrangellia Large Igneous Province). Contemporaneamente a questo riscaldamento globale, in paleoambienti marini si osserva un improvviso aumento dell'apporto di materiale silicoclastico, legato all'aumento della piovosità, un cambio nel tipo di produzione carbonatica e condizioni anossiche nei bacini più ristretti.
Questo intervallo relativamente breve (ca. 1–2 milioni di anni) di clima prevalentemente umido coincide con un grande cambiamento della fauna marina e terrestre e della flora, sia per tasso di speciazione (famiglie di conifere e felci moderne, bennettitali) e rinnovamento degli ecosistemi (nannofossili calcarei e dinosauri), rappresenta uno dei più importanti eventi biologici dell'intero Fanerozoico. Nelle terre emerse è stato osservato un drastico aumento delle flore di tipo umido ed essudazione di resina da parte di piante xerofitiche (conifere). Dicinodonti e rincosauri, che rappresentavano oltre 50% delle faune terrestri, vengono rimpiazzate dagli arcosauri e dai dinosauri. Si tratta del più evidente cambiamento climatico, ecologico ed evolutivo del Triassico, sul quale la comunità scientifica durante questi ultimi anni ha indagato sempre con maggior interesse.

GLI EVENTI ANOSSICI OCEANICI: CRISI E OPPORTUNITÀ PER LA BIOSFERA MARINA

Erba E.

Dipartimento di Scienze della Terra "Ardito Desio", Università degli Studi di Milano, Via Mangiagalli 34, 20133 Milano.

Gli Eventi Anossici Oceanici (OAE) rappresentano delle perturbazioni estreme del Sistema Terra che ha sperimentato drastici cambiamenti del regime climatico e oceanografico e profonde anomalie nel ciclo globale del carbonio. Durante il Mesozoico si sono verificati vari OAE ma quelli riscontrati globalmente sono l'OAE del Toarciano (T-OAE, ~183 Ma), l'OAE dell'Aptiano inferiore (evento Selli, OAE 1a, ~120 Ma), e l'OAE del Cenomanian sommitale (evento Bonarelli, OAE 2, ~93 Ma), tutti correlati con eccezionali eventi igneo-tettonici che hanno prodotto grandi province magmatiche. La definizione di OAE fu ispirata dalla presenza nel record litostratigrafico italiano di orizzonti peculiari di "black shales" - successivamente ritrovati anche negli oceani - studiati da specialisti di tutto il mondo per comprendere cause e conseguenze di cambiamenti globali che hanno alterato la biosfera e gli ecosistemi marini e terrestri.
I dati disponibili suggeriscono che gli OAE sono connessi con un rapido significativo aumento della temperatura, indotto da eccesso di CO2 (vulcanogenica e/o metanogenica) nel sistema oceano-atmosfera. Il riscaldamento globale ha innescato un'accelerazione del ciclo idrologico con aumento dell'alterazione meteorica, dilavamento e riciclo di nutrienti. I "black shales" del T-OAE, OAE1a e OAE2 sono il risultato di un forte aumento di produttività primaria e simultaneamente di una crisi degli organismi calcificatori in condizioni di acidificazione degli oceani.
Gli OAE sono un analogo dei cambiamenti globali dell'Antropocene e offrono l'opportunità di comprendere lo stato futuro del pianeta, la resilienza degli ecosistemi e capacità adattiva della biosfera. Molte nuove specie sono comparse durante gli OAE mentre le estinzioni sono estremamente rare e del tutto marginali. Lo studio paleontologico-geologico degli OAE rivela storie di crisi e di nuove opportunità che sembrano rappresentare il "bacio della vita" piuttosto che il "bacio della morte".

IL LIMITE CRETACICO/PALEOGENE: DALLE PRIME SEGNALAZIONI ALLE INTERPRETAZIONI ATTUALI

Premoli Silva I.

Dipartimento di Scienze della Terra "Ardito Desio", Università degli Studi di Milano, Via Mangiagalli 34, 20133 Milano.

Il limite Cretacico/Paleogene, (K/Pg o K/T), attualmente datato a ca 66 Ma, coincide con il più recente dei cinque grandi eventi di estinzione ("big five") della storia geologica del Pianeta Terra. Numerosi sono i gruppi fossili soprattutto marini e subordinatamente terrestri fiorenti nel Maastrichtiano che scompaiono o sono fortemente decimati in tempi geologicamente molto brevi in corrispondenza della base del Daniano. L'analisi micropaleontologica a scala millimetrica della Scaglia Rossa della sezione di Gubbio (Bottaccione) ha messo in evidenza la scomparsa improvvisa della ricca fauna a foraminiferi planctonici seguita dal ripopolamento da parte di una fauna poco diversificata e di piccole dimensioni dopo la deposizione di un livelletto di 2 cm di argilla verde indi rossa. Studi successivi hanno documentato la presenza di alti contenuti di iridio, elemento extra-terrestre, nella cosiddetta "boundary clay". Attualmente la "anomalia dell'iridio", spesso associata a tectiti, shocked quartz, ejecta, ecc., documentata in numerosissime località a scala globale, viene collegata all' impatto di un bolide extra-terrestre, almeno 10 km in diametro, il cui cratere ("Chicxulub crater") è stato identificato dopo anni di ricerche nella penisola dello Yucatan (Messico). Gli ultimi studi si sono focalizzati sulla ricerca di possibili concause (es. vulcanesimo e/o acidificazione delle acque oceaniche) per meglio spiegare gli effetti sul plancton e benthos calcareo.

THE PALEOCENE-EOCENE THERMAL MAXIMUM IN ITALY: THE STATE OF THE ART

Giusberti L.[1], Boscolo Galazzo F. [2]

[1] Dipartimento di Geoscienze, Università degli Studi di Padova, via Giovanni Gradenigo 6, 35131 Padova;
[2] School of Earth and Ocean Sciences, Cardiff University, Main Building Park Place, Cardiff CF10 3AT.

The Paleocene-Eocene Thermal Maximum (PETM; ca. 55.6 Ma) is the most intense and rapid climate warming event of the Cenozoic (e.g., McInerney & Wing, 2001). During the PETM, Earth's surface temperature increased by at least 5°C in few thousand years remaining high for at least 100 kyr. The hallmark of the PETM is a global negative excursion in carbon isotopes (the CIE; 2-7‰) attributed to a massive and rapid input of isotopically light carbon into the ocean-atmosphere system which led to rapid and extreme global warming. The severe climatic perturbations associated with the PETM affected both marine and terrestrial ecosystems, triggering faunal and floral radiations, migrations and the most severe Cenozoic extinction of deep-sea benthic foraminifera, the benthic foraminiferal extinction event (BEE). Over the last 27 years, multi-proxy high resolution analyses across both continental and marine sedimentary archives extensively explored several aspects of this crucial event. Nonetheless many key questions are still object of strong debate. Since the beginning of the 2000's, the lower Paleogene marine records from the Umbria-Marche (Northern Apennines, Italy) and Belluno (Southern Alps, Italy) basins appeared critical for integrated stratigraphic studies on the PETM and as a basis for insightful environmental reconstructions. Some crucial reference sections in Scaglia Rossa-type facies, such as the Contessa, Possagno, Forada and Cicogna, have significantly contributed to the knowledge of PETM disruptions. Among them, the Forada, located in the Belluno Basin, was the focus of integrated micropaleontological (calcareous plankton and benthic foraminifera) and geochemical-stratigraphical studies that led to the most complete reconstruction across the PETM in Europe to date (Giusberti et al., 2016).

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DID THE MEDITERRANEAN EVER DRY OUT? THE FOSSIL RECORD OF THE MESSINIAN SALINITY CRISIS

Carnevale G.

Dipartimento di Scienze della Terra, Università degli Studi di Torino, Via Valperga Caluso 35, 10125 Torino.

The Messinian salinity crisis (MSC) was a relevant ecological crisis that had a great impact on the geological history of the Mediterranean basin. The paleontological record of the MSC is largely incomplete and in part inadequate to thoroughly define the patterns of paleoenvironmental evolution of the Mediterranean in the time interval comprised between 6.974 and 5.33 Ma. Such an inadequacy of the fossil documentation is certainly related to the nature of the sedimentary record, which testifies the widespread development of stressed environmental conditions. The progressive development of unfavourable environmental conditions begun before the first phases of the MSC and eventually resulted in the apparent extinction of the euhaline benthic biota as well as of the calcareous plankton. During the past four decades, the apparent absence of these components of the aquatic ecosystem was roughly interpreted as the paleobiological evidence of the catastrophic hydrological and geomorphological changes that affected the Mediterranean during the uppermost Messinian stage. Overall, because of the catastrophic scenario evocated for the MSC, the sudden disappearance of euhaline benthos and calcareous plankton was implicitly considered as the product of the complete ecological collapse of the Mediterranean marine biome and of the annihilation of the aquatic biota. This approach was primarily based on the assumption that the paleontological record is always reasonably adequate and that the absence of the record necessarily corresponds to the reliable record of the (original) absence. Moreover, the negative paleobiological evidence used to support the catastrophic scenario did not include all the components of the original biota potentially available in the record. Recent extensive exploration of the Messinian sequences throughout the Mediterranean led to the development of a new stratigraphic model for the MSC comprising three evolutionary stages characterized by specific lithological features (CIESM, 2008; Roveri et al., 2014). This new stratigraphic model allowed a reliable analysis of the available fossil record throughout the three MSC stages revealing the continuous presence of marine taxa, both steno- and euryhaline. Such faunal and/or floral continuity is also suggested by indirect evidences.

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LA SESTA ESTINZIONE DI MASSA: *HOMO SAPIENS* SARÀ LA PRIMA SPECIE AUTO-MINACCIATA?

Pievani T.

Università di Padova, Dipartimento di Biologia, Via U. Bassi, n. 58/B, 35131 Padova.

Gli studi paleontologici non riguardano soltanto il tempo profondo, ma possono illuminare il nostro presente e persino, con cautela, il nostro futuro. Le estinzioni di massa sono uno dei principali schemi macro-evolutivi. In virtù della loro frequenza, dei loro effetti globali e della loro relativa velocità, hanno rimodellato la biodiversità terrestre in almeno cinque occasioni nel passato geologico. Le estinzioni di massa sono probabilmente dovute a un insieme di differenti possibili concause: super-eruzioni, impatti di asteroidi, cambiamenti climatici globali, tettonica a placche, etc. Un'analogia è stata dunque proposta alcuni anni fa. Se mettiamo a confronto i tassi e la magnitudine di estinzione durante questi eventi evoluzionistici speciali con il numero di specie perdute negli ultimi secoli a causa delle attività umane, secondo un gruppo di autorevoli studiosi, tra i quali Edward O. Wilson e Niles Eldredge, possiamo avere buone ragioni per pensare che Homo sapiens stia causando la cosiddetta Sesta Estinzione di Massa. In quanto elemento cruciale del dibattuto "Antropocene", la Sesta Estinzione di Massa significa che la nostra specie è diventata una forza dominante nell'evoluzione biologica. A causa di una micidiale miscela di attività impattanti che conosciamo bene (frammentazione degli habitat e deforestazione, crescita della popolazione, specie invasive, inquinamento industriale e agricolo, eccessivo sfruttamento delle risorse biologiche), abbiamo creato le condizioni per una grave crisi della biodiversità. Secondo Nature (2011), la Sesta Estinzione di Massa è agli inizi. Secondo Science (2014), dobbiamo introdurre un nuovo termine, piuttosto agghiacciante: de-faunazione. Secondo queste due autorevoli riviste, dunque, stiamo spolpando il pianeta. Nel mio intervento discuterò il modello delle estinzioni di massa noto come "tempesta perfetta", basato sull'idea che questi schemi macroevolutivi abbiano una struttura comune ricorrente, tripartita, rinvenibile anche nella Sesta Estinzione di Massa di origine antropica. In conclusione, considerando gli effetti impoverenti sui servizi ecosistemici dell'attuale crisi della biodiversità, che minaccia la salute e il benessere economico delle stesse popolazioni umane, proporrò provocatoriamente di introdurre una nuova categoria conservazionistica (le specie auto-minacciate, cioè quelle che hanno contribuito alle condizioni della loro stessa estinzione) e di includervi un mammifero di grossa taglia presuntuosamente definitosi "sapiens".

Terza sessione, chair Raffaele Sardella (Sapienza Università di Roma)

SYSTEMATICS AND PHYLOGENY OF THE LATE MIOCENE RHINOCEROTIDAE FROM CESSANITI (VIBO VALENTIA, SOUTHERN ITALY)

Pandolfi L.[1], Marra A.C.[2], Carone G.[3], Rook L.[4]

[1] Dipartimento di Scienze, Università degli Studi di Roma Tre, Largo S.L. Murialdo 1, 00146 Roma, Italy;
[2] Dipartimento di Scienze Matematiche e Informatiche, di Scienze Fisiche e di Scienze della Terra, Università degli Studi di Messina, Viale Ferdinando Stagno d'Alcontres 31, I-98166 Messina, Italy;
[3] Civico Museo di Ricadi (MURI), via Roma s.n.c, I-89861 Santa Domenica di Ricadi (VV), Italy;
[4] Dipartimento di Scienze della Terra, Università degli Studi di Firenze, Via G. La Pira 4, 50121 Firenze, Italy.

The mammal-bearing site of Cessaniti is characterized by *Clypeaster*-rich sands chronologically referred to a time span between 8.1 and 7.2 Ma. The terrestrial mammal assemblage collected from this locality includes the primitive elephantoid *Stegotetrabelodon syrticus*, two giraffids, *Bohlinia* cf. *attica* and *Samotherium* cf. *boissieri*, a boselaphine identified as *Tragoportax* cf. *rugosifrons,* and a rhinocerotid of unclear taxonomic affinities.
Among the rhinoceros material, a fragmentary skull represents the object of this contribution.
The skull belongs to a relatively large-sized two-horned rhinoceros; it morphologically differs from several late Miocene European species showing resemblances with some African taxa.
A preliminary cladistic analysis was performed in order to investigate the phylogenetic relationships of the rhinoceros from Cessaniti and its taxonomic position; 214 characters (70 cranial, 14 mandibular, and 130 dental, equally weighted) were considered in this work. The analysis was performed in PAUP 4.0b10, heuristic search, TBR (tree-bisection-reconnection), and 1,000 replications with additional random sequence, gaps treated as missing. Thirty-seven taxa were included in this analysis and the selected outgroup was *Trigonias osborni*.
One parsimonious tree was obtained from cladistic analysis. The tree topology results in two major clades, Elasmotheriinae and Rhinocerotinae. The latter group includes two clades identified as Aceratheriini and Rhinocerotini. Within Rhinocerotini, the Teleoceratina (hippo-like extinct rhinos and relatives) and the Rhinocerotina (living rhinoceroses and relatives) are sister-groups. Rhinocerotina includes several minor clades, one of them is composed by species belonging to the living genera *Diceros* and *Ceratotherium*, and closely related forms. The rhinoceros from Cessaniti is located within this "African" clade, but it displays less derived features than in the genus *Ceratotherium*.

SUS STROZZII (SUIDAE, MAMMALIA) FROM THE EARLY PLEISTOCENE OF ITALY AND A PHYLOGENETIC ANALYSIS OF SUINES

Sorbelli L.[1], Crotti M.[2], Iurino D.A.[3,4], Sardella R.[3,4], Souron A.[5], Cherin M.[4,6]

[1] Dipartimento di Scienze della Terra, Università degli Studi di Torino, Via Valperga Caluso 35, 10125 Torino, Italy;
[2] Institute of Biodiversity, Animal Health and Comparative Medicine, University of Glasgow, G12 8QQ Glasgow, UK;
[3] Dipartimento di Scienze della Terra, Sapienza Università di Roma, P.le A. Moro 5, 00185 Roma, Italy;
[4] PaleoFactory, Sapienza Università di Roma, P.le A. Moro 5, 00185 Roma, Italy;
[5] De la Préhistoire à l'Actuel: Culture, Environnement et Anthropologie (PACEA), UMR 5199 CNRS, Université de Bordeaux, Allée G. Saint Hilaire, CS 50023, 33615 Pessac, France;
[6] Dipartimento di Fisica e Geologia, Università di Perugia, Via A. Pascoli, 06123 Perugia, Italy;

Sus strozzii is the only species of Suinae occurring in the first part of Early Pleistocene in Europe and western Asia. It is characterized by large body size and several morphological similarities with extinct and extant pigs from Island South East Asia (ISEA), such as the Javan Warty Pig *S. verrucosus*. In this study, a new mandible of *S. strozzii* from the Early Pleistocene of Pantalla (central Italy) is described and the diagnosis of the species is emended.
Based on 52 craniomandibular and dental morphological characters, the first phylogenetic analysis of both living and fossil Eurasian and African Suinae is carried out to reconstruct their relationships. Our results agree with the literature based on molecular and/or morphological analyses. The late Miocene *Microstonyx* is the first taxon to branch off the Suinae clade. The separation between the African (*Kolpochoerus*/*Hylochoerus* and *Metridiochoerus*/*Phacochoerus*) and the Eurasian (*Sus*) clades occurred early, probably even in the late Miocene. The inclusion of *Potamochoerus* in the latter group is questionable, being probably due to the retaining of similar plesiomorphic characters in this African pig and in *Sus*. Our results also support referring the Early Pleistocene *"Kolpochoerus" phacochoeroides* from Maghreb and *"Sus" falconeri* from the Siwalik Hills to the genus *Metridiochoerus*. The Wild Boar *S. scrofa* and the Early–Middle Pleistocene *S. lydekkeri* are the species of *Sus* that display the most numerous plesiomorphic character states. They are followed by the monophyletic group of suines that show verrucosic lower canines, which includes the Pliocene *S. arvernensis*, *S. strozzii*, and the extinct and extant verrucosic pigs from ISEA.
This new evidence confirms the relationship between *S. arvernensis* and *S. strozzii* and suggests that the center of origin of verrucosic species of *Sus* is located in southeastern Asia. Moreover, this study encourages new prospections especially in that area to clarify the phylogenetic affinities between Asian and European pigs.

NEW MATERIAL OF *PSEUDODAMA NESTII* (MAMMALIA, CERVIDAE) FROM THE EARLY PLEISTOCENE OF PANTALLA (PERUGIA, CENTRAL ITALY)

Holpin S.[1], Breda M.[2], Iurino D.A.[3,4], Sardella R.[3,4], Cherin M.[4,5]

[1] School of Earth Sciences, University of Bristol, Bristol, UK, sh17510@bristol.ac.uk; Grant Institute, The King's Buildings, James Hutton Road, Edinburgh EH9 3FE, UK;
[2] Department of Human Studies, University of Ferrara, Corso Ercole I D'Este, 32, Ferrara 44100, Italy;
[3] Dipartimento di Scienze della Terra, Sapienza Università di Roma, P.le A. Moro 5, I-00185 Roma, Italy;
[4] PaleoFactory, Sapienza Università di Roma, P.le A. Moro 5, I-00185 Roma, Italy;
[5] Dipartimento di Fisica e Geologia, Università di Perugia, Via A. Pascoli, I-06123 Perugia, Italy;

The Cervidae are a family of artiodactyls that includes over 50 extant species and presents a very rich fossil record. After the origin of the family in Asia during the Early Miocene and the outstanding diversification during the Plio-Pleistocene, only three genera still survive in the Mediterranean area, *Capreolus*, *Dama*, and *Cervus*. The earliest forms of "*Dama*-like" deer found in the Italian Peninsula refer to the Late Pliocene and Early Pleistocene. Due to overall morphological similarity to the modern fallow deer, these cervids are allocated – not without controversy – into the genus *Pseudodama*, whose different species are recognized mainly on the basis of antler morphology and secondarily according to some tooth, cranial, and postcranial characters. Despite the relatively rich Plio-Pleistocene fossil record of these forms, their systematic status and phylogenetic relationships remain unclear.

Very well-preserved remains of terrestrial mammals were found in 1994-1995 at Pantalla (Perugia, central Italy). The assemblage is referred to the late Early Villafranchian (Olivola/(Tasso?) Faunal Units). Several cervid remains were found along with those of other taxa, including *Apodemus* cf. *dominans*, *Canis etruscus*, *Vulpes* sp., *Lynx issiodorensis*, *Acinonyx pardinensis*, *Lutraeximia umbra*, *Sus strozzii*, *Equus* sp., and *Mammuthus* cf. *meridionalis*. The faunal assemblage is exceptional for the abundance and state of preservation of cranial remains.

The present work deals with the remains of medium-sized cervid referable to *Pseudodama*. The sample includes two excellently well-preserved crania, antlers, mandibles, and postcranial material. On the basis of our morphologic and morphometric analysis, the specimens are attributed to *Pseudodama nestii*. Additionally, some interesting paleobiological clues are investigated though CT-scan-based digital analysis. *Pseudodama* is considered a paraphyletic stem group whose morphology and size are similar to those of the modern fallow deer.

THE EUROPEAN CROASSROAD: EARLY PLEISTOCENE PALEOENVIRONMENTS OF THE ITALIAN PENINSULA

Strani F.[1,2,3], Bellucci L.[2,3,4], Conti J.[1], DeMiguel D.[5,6,7], Iurino D.A.[1,2], Mecozzi B.[1,2], Sardella R.[1,2,3]

[1] Dipartimento di Scienze della Terra, Sapienza - Università di Roma, P.le Aldo Moro 5, 00185 Roma, Italy;
[2] PaleoFactory, Sapienza – Università di Roma, P.le Aldo Moro 5, 00185 Roma, Italy;
[3] Istituto Italiano di Paleontologia Umana, via U. Aldrovandi 18, I-00197 Roma, Italy;
[4] Polo museale Sapienza, "Sapienza – Università di Roma", P.le Aldo Moro 5, 00185 Roma, Italy;
[5] Fundación ARAID, Zaragoza, Spain;
[6] Departamento de Ciencias de la Tierra, Área de Paleontología. Universidad de Zaragoza, C/ Pedro Cerbuna 12, 50009 Zaragoza, Spain;
[7] Institut Català de Paleontologia Miquel Crusafont, Edifici Z, C/ de les Columnes s/n, Universitat Autònoma de Barcelona, 08193 Cerdanyola del Vallès, Barcelona, Spain.

The Plio-Pleistocene transition was characterized by the onset of Quaternary glacial cycles marked by a 41 ka periodicity, which led to a gradual drop in global temperatures. Through the early Pleistocene these climatic oscillations deeply affected terrestrial ecosystems of the Mediterranean region, with the development of drier conditions, reduction of sub-tropical vegetation and the dispersal of several large open dwellers mammals. In this period the Italian peninsula represented a crossroad between Europe and Africa, East and West, thus making the Italian fossil record an exceptional laboratory to study the palaeonvironmental conditions that favoured the spread of many mammal taxa, among which the *Homo* genus. During the earliest Pleistocene, the paleoenvironment of the middle Villafranchian faunal assemblages was characterized by the presence of a mosaic of habitats as attested by the variety of large mammals and by highly diversified feeding behaviors of the fossil ungulates from the site of Coste San Giacomo (2.1 Ma). The middle/late Villafranchian transition was marked by significant climatic oscillations which led to the disappearance of certain biomes in favour of an expansion of colder and more arid environments, and to important bioevents such the first occurrence of the large carnivore *Pachycrocuta brevirostris*. In this phase herbivore ungulates display a narrower range of diet types as testified in the late Villafranchian Faunal Unit of Olivola (1.8 Ma). During the late early Pleistocene (late Villafranchian/Epivillafranchian faunas) antelopes-*Eucladoceros–Leptobos* are replaced by ovibovines-*Praemegaceros–Bison* assemblages and the presence of the first human populations are testified in the site of Pirro Nord. Preliminary results on the dietary adaptations of the large herbivores from this locality, suggest that heterogeneous environments may have favoured the radiation of these taxa in the Italian Peninsula.

NEW PALAEONTOLOGICAL DATA ON THE FONTANA RANUCCIO SITE (MIDDLE PLEISTOCENE, CENTRAL ITALY)

Conti J.[1], Bellucci L.[2], Iurino D.A.[1], Mecozzi B.[1], Strani F.[1], Terranova E.[1], Sardella R.[1]

[1] Dipartimento di Scienze della Terra, Sapienza Università di Roma, P.le Aldo Moro 5, 00185 Roma, Italy;
[2] Polo museale, Sapienza Università di Roma, P.le Aldo Moro 5, 00185 Roma, Italy.

The Anagni Basin, located within the Latina Valley (central Italy), includes two sites that are crucial to understand the evolution of mammal assemblages in Mediterranean Europe during the Pleistocene: Coste San Giacomo and Fontana Ranuccio. Both sites were discovered in the 1970s. Since then, an intense scientific activity has been carried out by the Italian Institute of Human Palaeontology (IsIPU) and the Department of Earth Science of Sapienza University of Rome.

The Fontana Ranuccio outcrop, dated around 400 kyr, is a reference-site for the Italian biochronological framework. It provides direct evidence of the Middle Pleistocene hominin occupation of the Italian Peninsula, testified by the occurrence of four isolated teeth and a rich lithic assemblage also including bone tools.

During the last decade, the Fontana Ranuccio faunal assemblage has been the subject of new studies and its comparison with those discovered in other important sites of similar age (Riano, Isernia La Pineta, Venosa Notarchirico, Atella, Calorie and Ceprano) has allowed a better understanding of the palaeoenvironmental evolution of central and southern Italy.

In 2017-2018, two parallel works have been carried out on different aspects of the Fontana Ranuccio fauna: the palaeocological analysis on the ungulate community based on hypsodonty, microwear and mesowear proxies, and the complete revision of the *Ursus* material.

In this work, we present the results obtained from these analyses, which shed new light on the structure of the 400 kyr ecosystems that existed during the Middle Pleistocene diffusion of *Homo* in Europe.

PRELIMINARY ANALYSIS OF THE LARGE MAMMAL FAUNA FROM LAYERS G TO K OF GROTTA ROMANELLI, APULIA (SOUTHERN ITALY)

Mecozzi B.[1,2], Bellucci L.[2,3,4], Bona F.[5], Cicia V.[1,2], Conti J.[1,2], Iannucci A.[1,2], Iurino D.A.[1,2], Mazzini I.[6], Pushkina D.[7], Sanzi R.[1,2], Strani F.[1,2], Sardella R. [1,2,4]

[1] Dipartimento di Scienze della Terra, Sapienza Università di Roma, Italy;
[2] PaleoFactory, Sapienza Università di Roma, Roma, Italy;
[3] Polo museale, Sapienza Università di Roma, Italy;
[4] Istituto Italiano di Paleontologia Umana, via Ulisse Aldrovandi, 18, 00197, Roma;
[5] Dipartimento di Scienze della Terra "Ardito Desio" Università di Milano, Italy;
[6] Istituto di Geologia Ambientale e Geoingegneria (IGAG), CNR, Area della Ricerca di Roma RM1, Via Salaria km 29,300, 00016 Monterotondo Stazione, Roma, Italy;
[7] University of Helsinki, Department of Geosciences and Geography, FI-00014 Helsinki (Finland).

Since 2015, after 42 years of inactivity in the field, an excavation campaign started at Grotta Romanelli (Castro, Lecce, south-eastern Apulia). The field activities are led by a team from "Sapienza University of Rome", in collaboration with IGAG CNR and other research institutions. Grotta Romanelli was discovered in 1874 but only in 1900 was recognised as a site of remarkable importance becoming the first report of the Palaeolithic in Italy. In 1914 G.A. Blanc led a pioneering excavation campaign, studying extensively the in-filling deposits. These deposits are bounded by Cretaceous limestone that Blanc considered shaped during MIS5, constraining the age of the deposits to the Late Pleistocene. The succession can be subdivided in two main parts: the upper and the lower complexes divided by the stalagmitic layer F (0-25 cm). The upper complex, known as "terre brune" (layers A-E) (360 cm), bears upper Palaeolithic tools and a cold climate vertebrate fauna including *Pinguinus impennis* (= *Alca impennis*). The "lower complex" includes the so called "terre rosse" (60-80 cm), the stalagmitic layer H (20 cm), the bone breccia (0-100 cm) and the beach deposits (0-60 cm). In the "lower complex" a diversified vertebrate fauna (including *Palaeoloxodon antiquus*, *Hippopotamus amphibius*, *Canis lupus* and other taxa) occurs, associated with Mousterian limestone artefacts. The two stalagmitic layers (F and H) were dated by Fornaca-Rinaldi by means of the $^{230}Th/^{234}Th$ method, giving respectively an age of 40 ± 3.2 kyr and > 69 kyr. New dating analyses are in progress.

Nowadays, the only data available about the mammal fauna from the "lower complex" are those reported by Blanc. Several authors suggested that the fossil remains of mammals from the "lower complex" could be chronologically referred to the late Middle Pleistocene. In particular, they attributed the canid remains from level G to the Early-Middle Pleistocene *Canis mosbachensis*. Recently, these fossils were studied in detail and were attributed to *Canis lupus*, making the first revision of the palaeontological material from the lower complex. The occurrence of a true wolf is in accordance with a late Middle to Late Pleistocene age for the lower complex.

Also, the rhino remains from the lower complex have been recently described. The rhino material from the layer G, previously referred to *Rhinoceros merckii* (=*Stephanorhinus kirchbergensis*), have recently been revised and referred to the narrow-nosed rhino *Stephanorhinus hemitoechus*. In addition, a single isolated proximal epiphysis of a third metacarpal coming from layer I has been attributed to *Coelodonta antiquitatis*.

The collections of the large mammal materials from the "lower complex" hosted at the Pigorini Museum and at the Italian Institute of Human Paleontology (IsIPU) are under revision. Moreover, the study of the new material excavated during the 2015-2017 field activities is in progress, with the main aim to evaluate its biochronological significance. In this scenario, in order to clarify the age of lower complex, a comparison of the palaeontological data with radiometric and stratigraphic analyses is therefore needed to strengthen the chronology of the faunal assemblage.

MARTELLICTIS GEN. NOV. (MAMMALIA, MUSTELIDAE) E LA SISTEMATICA DEI GALICTINI FOSSILI DELL'EURASIA

Bartolini Lucenti S.[1,2]

[1] Dottorato di Ricerca in Scienze della Terra, Università di Pisa, Via S. Maria 53, 56126 Pisa, Italy;
[2] Dipartimento di Scienze della Terra, Università degli Studi di Firenze, Via La Pira 4, 50121 Firenze, Italy.

Negli ultimi anni una grande varietà di revisioni genetiche e sistematiche hanno cambiato la nostra conoscenza della tassonomia della famiglia Mustelidae. Particolare e recente interesse è stato riscosso dalla sottofamiglia Galictinae Reig, 1956, la quale è stata raggruppata all'interno dell'altra sottofamiglia Ictonychinae Pocock, 1921. Tra i taxa fossili eurasiatici di tale sottofamiglia, i primi ad essere descritti furono *Enhydrictis* Major, 1901 e *Pannonictis* Kormos, 1931. Quest'ultimo è ben conosciuto e descritto da depositi plio-pleistocenici dell'Europa centro-meridionale, mentre *Enhydrictis* è una forma endemica e enigmatica, recuperata da depositi del Pleistocene della Sardegna. Ricerche recenti hanno mostrato come questi mustelidi, riferibili alla tribù Galictini, presentavano una paleodiversità più grande e un quadro tassonomico più complesso di quelli descritti in letteratura. Grazie a numerose evidenze, questa revisione propone una nuova reinterpretazione del materiale fossile di Galictini recuperato nei siti del Pleistocene inferiori del St. Vallier e Olivola, storicamente attribuiti a "*Mustela*" *ardea* Gervais, 1848-1852, e la sua attribuzione a *Martellictis* gen. nov. L'istituzione di *Martellictis ardea* rivela un panorama sistematico dei rappresentanti eurasiatici della sottofamiglia Ictonychinae più complesso di quello attualmente conosciuto, e allo stesso tempo questa riassegnazione sottolinea l'importanza della comprensione delle probabili origini dei peculiari adattamenti morfologici (come quelli di *Enhydrictis*) e allo stesso tempo chiarifica i rapporti filogenetici tra tutti questi taxa.

PROGRESS ON THE JOINT HOWARD UNIVERSITY, UNIVERSITY OF FLORENCE, SMITHSONIAN INSTITUTION EQUID PROJECT

Bernor R.L.[1], Cirilli O.[2], Rook L.[2]

[1] College of Medicine, Department of Anatomy, Laboratory of Evolutionary Biology, Howard University, Washington, DC 20059, USA;
[2] Dipartimento di Scienze della Terra, Università degli Studi di Firenze, Via G. La Pira 4, 50121 Firenze, Italy.

Our project was developed with the intention of pursuing the origin and early evolution of Old World *Equus.* We began with study of Villafranchian *Equus* housed by the Natural History Museum, University of Florence. Our international research group engaged in a number of hipparion-*Equus* projects:

1. Recognition of the second youngest known "*Hipparion*" in Europe from the Middle Villafranchian of Italy.
2. Study of two newly recognized species of *Sivalhippus*, *S. ptychodus* and *S. platyodus* from the late Miocene of China. We demonstrated that the *Sivalhippus* clade originated in the Indian Subcontinent and dispersed to Africa and China, 9-7 Ma.
3. Study of a newly recognized endemic lineage of hipparion, *Shanxihippus dermatorhinus* n. comb. from the Late Miocene of Shanxi Province, China. This lineage demonstrated to have evolved convergently with Eurasian *Cremohipparion* and *Proboscidipparion* in retraction of nasal bones in support of a tapir-like pseudo-proboscis for selective feeding.
4. Study of Indian Subcontinent equids led to the following discoveries: in Pliocene Tatrot horizons the Chinese lineage *Plesiohipparion huangheense* and the African lineage *Eurygnathohippus* recognized for the first time. Finally, original BMNH identifications of "*Hipparion*" *antelopinum* are actually a small *Equus.* We are interested in comparisons to *Equus altidens* from Italy (1.6-1.4 Ma from Pirro Nord).
5. Study of *Equus livenzoensis*, largest first occurring *Equus* in the Old World.
6. Study of the 3.3 Ma *Equus* (*Plesippus*) *simplicidens* Hagerman Quarry sample at the Smithsonian (50 cabinets with fully prepared_specimens collected in the early 1930s), never before published as an assemblage. The Hagerman horse sample will be of paramount importance for studying evolution, biogeography, paleoecology, demography and paleodiet of early *Equus* as well as representing a very robust statistical sample for future analyses of early Old World and extant *Equus.*

PLIOCENE STRATIGRAPHIC PALEOBIOLOGY IN TUSCANY AND THE FOSSIL RECORD OF MARINE MEGAFAUNA

Dominici S.[1], Danise S.[2], Benvenuti M.[3]

[1] Università degli Studi di Firenze, Museo di Storia Naturale, Firenze, Italy;
[2] Plymouth University, School of Geography, Earth and Environmental Sciences, Plymouth, UK;
[3] Università degli Studi di Firenze, Dipartimento di Scienze della Terra, Firenze, Italy.

Tuscany has a rich Pliocene record of marine megafauna (MM), including mysticetes, odontocetes, sirenians and seals among the mammals, and six orders of sharks among the elasmobranchs. This is reviewed with respect to paleogeography and sequence-stratigraphy in six different basins. Conditions at the ancient seafloor are explored by means of sedimentary facies analysis, taphonomy and multivariate techniques applied to a large quantitative dataset of benthic molluscs. MM is rare or absent in most basins during the Zanclean (with exceptions), and most abundant in Piacenzian deposits in all six basins. MM occurs preferentially in fine-grained, shelfal highstand-deposits of small-scale depositional sequences, or at condensed horizons of the maximum flooding interval. It is rare in shallow marine paleonvironments and nearly absent in bathyal paleosettings. Paleogeographic and paleoecological evidence and a comparison with modern patterns of marine upwelling suggest that a wedge of nutrient-rich waters sustained in the offshore during the Pliocene a high biomass of primary producers and a community of apex consumers and mesopredators, similarly to the modern northwestern Mediterranean Sea, with a species-richness higher than the modern and a more complex trophic structure. The highest MM diversity coincides with the mid-Piacenzian warm period, suggesting that facies control does not obscure a link between climate and diversity. We underline however that not all marine environments were suitable for marine mammal preservation. Buoyant carcasses were preferentially dismembered and destroyed in high-energy shallow waters, with the possible exception of delta front deposits, where sudden sediment input occasionally buried pristine carcasses. We hypothesize that carcasses sunken on the seafloor below the shelf break underwent destruction through the activity of a whale-fall biota of modern type, specialized in the consumption of decomposing tissues, both soft and mineralized. A taphonomic window was left between storm wave base and the shelf break. Here water pressure was high enough to prevent the formation of decomposing gases and the resurfacing of carcasses, while the lack of a specialized whale-fall biota slowed down bone degradation with respect to deeper settings. Sedimentation rate was high enough to cover skeletal material before its complete destruction. An estimate of paleobathymetries based on multivariate techniques suggests that the preferential depth for the inclusion of MM in the fossil record was 30– 300 m. The results are compared with major Mesozoic and Cenozoic MM records worldwide. Available evidence suggests that the late Neogene radiation of large whales, true ecosystem engineers, and their size increase, triggered the radiation of a bone-eating fauna that hampered, and hampers, MM preservation in the deep sea.

Quarta sessione, chair Lucia Angiolini (Università degli Studi di Milano)

FIRST RECORD OF SABELLIDS AND SERPULIDS (POLYCHAETA SABELLIDA) FROM THE PERMIAN OF WESTERN SICILY

Sanfilippo R.[1], Rosso A.[1], Reitano A.[2], Insacco G.[2]

[1] Department of Biological, Geological and Environmental Sciences, University of Catania, Corso Italia 57, 95129 Catania;
[2] Museo di Storia Naturale di Comiso, Via degli Studi 9, 97013 Comiso.

Some fossil tubeworms belonging to sabellids and serpulids and one serpulid operculum were found for the first time from the Permian limestone of the Sosio Valley (W Sicily) during the past three years.
A total of nine new species were described, for about twenty-five incomplete tubes (attached and free portions), mainly encrusting on skeletons of sponges, crinoids, brachiopods and stromatoporids (Sanfilippo et al. 2016, 2017, 2018 in press). The material includes some small tubes belonging to the sabellid *Glomerula* (with the species *G. gemmellaroi*) and six serpulids with large-sized tubes: *Paleotubus sosiensis*, *Propomatoceros permianus, 'Serpula' antiqua,* Serpulidae sp. 1, *'Serpula' calannai* and *'Serpula' prisca*. They are triangular or circular in cross-sections, and surprisingly possess ornamentations (keels, ribs and peristomes), although ancestral forms. An opercular cup referable to the genus *Pyrgopolon,* was also described under the name *P. gaiae*.
All morphological characters, as well as inner structure of the wall, even if barely detectable because of diagenesis, are preserved.
The tubeworm association together with invertebrates on which they settled on, presumably lived in exposed shallow-water palaeoenvironment, at the outer edge of a carbonate platform.
This material represents the first evidence of genuine calcareous tube-dwelling polychaetes from the Palaeozoic, and possibly so far unknown ancestral representatives of the families Sabellidae and Serpulidae.

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INVERTEBRATE TRACE FOSSILS FROM THE CISURALIAN CONTINENTAL BASINS OF THE SOUTHERN ALPS (ITALY)

Marchetti L.[1], Bernardi M.[2], Santi G.[3], Ronchi A.[3]

[1] Urweltmuseum GEOSKOP/Burg Lichtenberg (Pfalz), Thallichtenberg (Germany):
[2] MUSE – Museo delle Scienze, Trento (Italy);
[3] Dipartimento di Scienze della Terra e dell'Ambiente, University of Pavia (Italy).

A comprehensive ichnotaxonomic revision with the study of a large amount of new material was undertaken on the invertebrate trace fossils of the Cisuralian continental basins of the Southern Alps (Italy). The ichnoassociation comprises the following ichnogenera: *Avolatichnium, Circulichnis, Cochlichnus, Cruziana, Dendroidichnites, Diplichnites, Diploponichnus, Gordia, Helminthoidichnites, Helmithopsis, Lithographus, Lockeia, Octopodichnus, Palaeophycus, Planolites,* cf. *Protovirgularia, Rusophycus, Stiaria, Striachichnium, Taenidium,* cf. *Tonganoxichnus* and *Treptichnus.* Noteworthy the compound trace *Diplichnites* C *Avolatichnium*, interpreted as transitional walking and jumping behaviour of arthropod producers. The Pizzo del Diavolo Formation of the Orobic Basin, the Collio Formation of Collio Basin and The Monte Luco and Tregiovo Formations of the Athesian Volcanic Complex are characterized by abundance and diversity of surface traces in lacustrine to floodplain palaeoenvironments. The Conglomerato Basale in both Orobic and Collio basins and the Pietra Simona Mb. of the Conglomerato del Dosso dei Galli Fm. in the Collio Basin are instead characterized by abundant but not diverse shallow burrows in alluvial fan to marginal-shallow lake environments, respectively. The absence of trace fossils able to cut firm substrate is consistent with soft sediment at the time of impression of the trace fossils. This ichnoassociation clearly belongs to *Scoyenia* and to a lesser extent, depaupered *Mermia* ichnofacies sensu Buatois & Mangano (2011). The ichnoassociation is characterized, to date, by the rarity of backfilled meniscate burrows and infaunal traces and predominance of surface traces, so it is more similar to Devonian-Carboniferous continental ichnoassociations rather than to Permian-Mesozoic continental ichnoassociations, which instead include abundant and diverse backfilled meniscate burrows and deeper trace fossils.

LE MACROFAUNE BENTONICHE DELLA SEZIONE DI SERES/MISCHI IN VAL BADIA NEL CONTESTO DELL'ESTINZIONE PERMIANO-TRIASSICA

Prinoth H.

Museum Ladin Ursus ladinicus, Strada Micurà de Rü 26, 39030 San Cassiano.

Il limite Permiano-Triassico della sezione di Seres/Mischi in Val Badia è stato oggetto in passato di diversi studi stratigrafici, paleomagnetici e palinologici, mentre le macrofaune a bivalvi e brachiopodi non sono state ancora considerate. Le ricerche biostratigrafiche si sono concentrate sul tetto della Formazione a Bellerophon con i calcari riccamente fossiliferi del Membro di Bulla (Permiano superiore), e sulla base della Formazione di Werfen, rappresentata dai calcari oolitici del Membro di Tesero (Permiano superiore-Triassico inferiore) e le marne della parte basale del Membro di Mazzin (Triassico inferiore).

Durante l'estinzione Permiano-Triassica i brachiopodi rhynchonelliformi hanno subito forti estinzioni, mentre i bivalvi hanno subito perdite minori. Questa selettività tassonomica si rispecchia nella successione delle faune nella sezione di Seres/Misci. In questa sezione, come nella vicina sezione del Sass de Putia (Posenato, 2009), l'estinzione di massa del Permiano-Triassico inizia al passaggio fra il Membro di Bulla e il Membro di Tesero e si protrae con più fasi fino alla base del Membro di Mazzin. Il Membro di Bulla presenta faune ricche di brachiopodi dominate da *Comelicania*, *Janiceps* e *Comelicothyris.* Alla base del Membro di Tesero queste faune vengono prima parzialmente sostituite con brachiopodi opportunisti dei generi *Ombonia* ed *Orthothetina* e poi, dopo la loro estinzione, sostituite da faune dominate dai bivalvi *Eumorphotis*, *Promyalina*, ?*Pteria, Towapteria e Unionites*. Soltanto nella sezione di Tesero i brachiopodi (*Orbicoelia, Streptorhynchus, Teserina*) sono ancora presenti fino alla parte media del Membro di Tesero (Posenato, 2009).

La presenza a Seres/Mischi di una fauna relativamente ricca alla base del Membro di Mazzin dominata dal brachiopode *Orbicoelia* associato con i bivalvi *Towapteria* ed *Eumorphotis*, con resti di crinoidi e microconchidi fa di questa sezione uno degli ultimi rifugi per brachiopodi permiani della Tetide occidentale.

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VARIATION IN BRACHIOPOD MICROSTRUCTURE UNDER LOW PH - OCEAN ACIDIFICATION - CONDITIONS

Ye F.[1], Angiolini L.[1], Crippa G.[1], Henkel D.[2], Jurikova H.[2], Brand U.[3]

[1] Dipartimento di Scienze della Terra "A. Desio", Università degli Studi di Milano, Milan, Italy;
[2] GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, Germany;
[3] Department of Earth Sciences, Brock University, 1812 Sir Isaac Brock Way, St. Catharines, Canada.

Modern and future CO_2-induced ocean acidification is potentially a big threat to marine carbonate-shelled animals. To understand the relationship between biomineralization processes and ocean acidification, an increasing number of experiments have been performed investigating the response to lower pH conditions of several calcifying marine organisms (e.g., brachiopods, bivalves and gastropods).
In this study, we investigated six adult individuals of the cold-water brachiopod *Magellania venosa* (Dixon, 1789), which were collected in Chile and subsequently cultured at GEOMAR, Kiel, under different pH conditions (7.35 to 8.15) and over different time intervals. Details of shell microstructures, such as morphology of the basic structural unit (fibre), thickness of the primary layer and density of endopunctae, were analysed using the scanning electron microscopy (SEM). Based on a comprehensive dataset of shell microstructures, we observed significant morphometric variations. In particular, under low pH conditions, the individuals of *M. venosa* produced smaller secondary layer fibres, a thicker primary layer and a higher density of endopunctae. Overall, *M. venosa* tended to produce a more organic matter-rich shell when exposed to low pH conditions for a time interval corresponding to at least one year. This result lends strong support to brachiopod microstructure variations observed in the geological past during major ocean acidification events (i.e. the end-Permian). Stable isotope compositions were tested along shell ontogenetic increments of corresponding dorsal and ventral valves. Shell growth during culturing at higher CO_2 (2000 and 4000 ppm) and consequently lower pH conditions is documented by increasingly negative values of $\delta^{13}C$ and $\delta^{18}O$. The cultured isotope compositions are significantly different compared to those of shell growth under current ambient seawater conditions and atmospheric CO_2 of 400 ppm at Chile. These observations may be an invaluable proxy for studying ocean acidification events and atmospheric CO_2 contents in the geological past.

BIOMINERALIZATION AND AGGLUTINATION IN THE CARRIER SHELL *XENOPHORA CRISPA* (KÖNIG, 1825)

Crippa G., Pasinetti G., Dapiaggi M., Angiolini L.

Dipartimento di Scienze della Terra 'A. Desio', Università degli Studi di Milano, via Mangiagalli, 34, 20133, Milano.

Xenophora is a genus of marine gastropods with the ability to form their shells agglutinating objects with different origins, from other shells to bio- or lithoclasts. The available literature on *Xenophora* shell microstructure and on the nature of the cement used to agglutinate fragments to the shell is scanty, as well as on the mechanisms of agglutination and its functional meaning.
Different agglutination potentials are shown by species of *Xenophora*, from species lacking attachments to others completely covered, as the case of the Mediterranean *Xenophora crispa* (König, 1825). Shell sections of fossil (early Pleistocene, Arda and Stirone Rivers, Italy) and Recent specimens (Mediterranean Sea, Spain) of *X. crispa* were analyzed at the Scanning Electron Microscope (SEM) and powders collected from different parts of the shell, at X-Ray Diffraction (XRD), in order to characterize the microstructure and the mechanisms leading to the agglutination of objects. SEM analyses revealed the presence of a thin prismatic layer (~5μm) below the agglutinated fragments, whereas the bulk of the shell is composed by typical aragonitic microstructure (crossed lamellar fabric), with the exception of prismatic/spherulitic layers present in the thickest part of the shell (columella and peripheral edge). XRD analyses indicated aragonite as the major component of the shell, although calcite, which is usually uncommon in gastropod shells, sporadically occurred in both fossil and recent specimens, mainly in the columella and peripheral edge. These results suggest that
a) shells and bio/lithoclast attachment in *X. crispa* occur on prismatic microstructure, which thus is a highly functional fabric for attachment (e.g., muscle attachment in bivalves), b) *X. crispa* shells are composed by both aragonite and calcite, with the latter probably limited to thin prismatic/spherulitic layers mainly in the columella and peripheral edge.

PLIOCENE OYSTERS FROM VALLE BOTTO AREA (NW ITALY): THE LEAST STUDIED OF THE QUARRY, BUT VERY USEFUL AMONG MOLLUSCS IN TAXONOMY, PALEOECOLOGY AND MORPHOMETRICAL ANALYSES

De Bortoli L.[1,2], Martinetto E.[1], Hiadilová Š.[3]

[1] Dipartimento di Scienze della Terra, Università degli Studi di Torino, via Valperga Caluso 35, 10121 Torino, Italia;
[2] Univerzita Karlova, Přírodovědecká fakulta, Univerzita Karlova Albertov 6, 12843 Praha 2, Praha, Česká Republika;
[3] Katedra biologie PdF UP v Olomouci, Purkrabská 2, 77900 Olomouc, Česká Republika.

A preliminary study is here presented about systematical, paleoecological and morphometrical analyses of Pliocene oysters from Valle Botto (Asti sands, Middle-Upper Pliocene, northwestern part of Italy). The most common oyster species is represented by *Ostrea edulis* Linnaeus, 1758, whose specimens are stored at the "Museo Paleontologico Territoriale dell'Astigiano" of Asti and at the Geological and Paleontological Museum of the University of Turin. The oyster environment corresponds to the circalittoral-infralittoral zone, as shown by a gradual transition from silty to sandy lithologies; at Valle Botto, the "Transition facies" marks the boundary between the "SFBC" (well calibrated fine sands) paleocommunities and the "DL" detrital biocenosis, rich in specimens of the genus *Neopycnodonte*. Some of the studied oyster specimens present moderate bioerosion and bioencrustation, caused typically by the activity of sponges, bryozoans, worms and bivalves (oysters as well); we can observe reticular, channel shaped and punctuate structures, referable to the *Entobia* and *Gastrochaenolites* trace fossils. Morphometrical analyses were performed in order to measure oyster shell height (H), shell maximum length (W), hinge length (W1), distance between the resilifer area and the upper part of the muscle scar (H1), ventral length (W2), distance between lower part of the muscle scar and ventral margin (H2), and opening angle of the muscle scar (α). Subsequently, W/H, W1/H1 and W2/H2 ratios were calculated through a regression analysis, showing a direct correlation (2nd degree polynomial function) among these parameters (usefulness proxy in the determination of uncertain species), especially on the left valves. In reference to previous studies (Miocene oysters from the Carpathian Foredeep) and analyses on 3D oyster reefs, a secondary aim of this research is to develop a "workflow" for the analysis of the oyster morphospace, based on the morphometrical profile, from the 2D to the 3D oyster model, in order to get a retopologied shape; in this way we can match qualitative data analyses from all oyster samples.

THE OCCURRENCE OF FOSSIL AND LIVING *CYTHERISSA LACUSTRIS* (G. O. SARS 1863) IN ITALY

Mazzini I.[1,2]

[1] Istituto di Geologia Ambientale e Geoingegneria (IGAG), CNR, Area della Ricerca di Roma RM1, Via Salaria km 29,300, 00016 Monterotondo Stazione, Roma, Italy;
[2] PaleoFactory, Sapienza Università di Roma, Roma, Italy.

Cytherissa lacustris is predatory benthic ostracod indicator of environmental changes related to euthrophication processes at the sediment-water interface in recent and historical times. It as a typical oligothermophilous ostracod (≤ 18°C) and a lacustrine dweller. At present the species is distributed in the Palaearctic and Nearctic Region. In Italy, at the beginning of the 20th century, it has been reported as living in the Bracciano and Maggiore lakes, but these records have not been confirmed.

In 1990, an entire special volume "*Cytherissa* – the Drosophila of paleolimnology" was devoted to research findings on the cytherid species *C. lacustris* and focused on many aspects of the geographical and ecological distribution of this ostracod species. The driver for such a volume has been the discovery that, in Lake Constance in Switzerland, the extinction of this species was found to be an ideal indication of the onset of eutrophication. This was confirmed by a study on another alpine lake, the Mondsee lake in Austria, where *C. lacustris* disappeared during the 1950s, due to eutrophication. In many paleo-lacustrine settings close to the Alps, the occurrence of this species has been used as an indication of cold and deep waters and its disappearance coincides with the eutrophication of the lakes.

Until 1990, in Italy the only fossil records came from the Holocene lacustrine sediments of Tanataviele (Friuli, Northern Italy) and the Pleistocene lacustrine sediments of the Liri Valley (Latium Central Italy). During the subsequent 28 years, many researches have focused on the ostracods occurring in the continental sequences cropping out south of the Alps and in the central and southern Apennines mostly through investigation of sediment cores. *C. lacustris* has been reported in some of them: the late Holocene of Triponzo (Umbria), the Late Glacial- early Holocene sequence of Lago Piccolo of Avigliana (Val di Susa, Piedmont), the Albano Lake (Alban Hills, Latium), the Ripa Sottile Lake (Rieti Basin, Latium), the Pantano of San Gregorio Armeno (Campania), the early Late Pleistocene of the Leonessa Basin (Latium), the Middle Pleistocene of Valle di Castiglione.

Recently, high resolution stratigraphic and temporal investigations have been performed on a composite section from the Sulmona basin (Abruzzo). The lacustrine carbonatic silts, referred to the early Last Glacial, bear a rich ostracod fauna, where *C. lacustris* is one of the dominant species. This finding led to a revision of the occurrence and distribution of this species in Italy and to a reassessment of its role as indicator of oligotrophic conditions. Moreover, in the Sulmona sequence, climatic changes, such as the Greenland Interstadial 24, well recorded by geochemical proxies do not drive parallel changes in the frequency and occurrence of *C. lacustris*. The regime shift linked to such global climatic event seems to be buffered by local to regional conditions, probably linked to the hydrogeological setting of the basin itself or by the resilience of the species itself.

Quinta sessione, chair Guido Roghi (CNR Padova)

LA FLORA DEL PERMIANO INFERIORE (KUNGURIANO) DI TREGIOVO (VAL DI NON, TRENTO): UNO STUDIO PALEOBOTANICO E GEOCHIMICO

Forte G.[1,2], Kustatscher E.[1,3], Roghi G.[4], Preto N.[2]

[1] Museo di Scienze Naturali dell'Alto Adige, Via Bottai 1, 39100 Bolzano;
[2] Dipartimento di Geoscienze, Università di Padova, via G. Gradenigo 6, 35131;
[3] Department für Geo- und Umweltwissenschaften, Paläontologie und Geobiologie, Ludwig-Maximilians-Universität, und Bayerische Staatssammlung für Paläontologie und Geologie, Richard-Wagner-Straße 10, 80333 München, Germany;
[4] Istituto di Geoscienze e Georisorse, C.N.R., via G. Gradenigo 6, 35131.

Il piccolo bacino sedimentario di Tregiovo, alta Val di Non (Trento) è noto fin dallo scorso secolo per il suo contenuto fossilifero. In tempi recenti, nella località di "Le Fraine" vicino a Tregiovo, è stata scoperta una delle flore kunguriane meglio documentate della Pangea orientale. Due livelli a piante, rispettivamente a 45 m (livello A) ed a 105 m (livello B) dalla base della sezione, hanno restituito una ricca flora comprendente sfenofite (*Annularia*), taeniopteridi (*Taeniopteris*), felci con seme (*Peltaspermum*), possibili felci (*Sphenopteris*), ginkgofite, (*Sphenobaiera*) e conifere (*Hermitia*, *Feysia*, *Quadrocladus*, *Dolomitia, Pseudovoltzia*). Tutti i vari taxa sono presenti in entrambi i livelli, ma con diverse abbondanze. Le conifere rappresentano il gruppo dominante. Attraverso la morfologia fogliare sono stati identificati quattro taxa. Uno studio geochimico condotto sulla materia organica dispersa nel sedimento ha permesso di ottenere una curva del $\delta^{13}C$ dalla sezione di "Le Fraine" e dalla sezione correlata del villaggio, che mostra una oscillazione negativa del 4–5‰ (VPDB). Nella sezione di "Le Fraine" questa oscillazione corrisponde con il livello B. Un successivo studio isotopico taxon-specifico sulla composizione isotopica dei resti organici delle conifere ha dimostrato come non esista alcuna differenza isotopica significativa tra taxa diversi, quanto piuttosto una differenza evidente tra valori isotopici delle conifere del livello A e del livello B, con queste ultime più negative. Questo risultato non solo conferma la solidità della oscillazione negativa del $\delta^{13}C$, ma anche il confronto con simili oscillazioni in diverse curve kunguriane del $\delta^{13}C$ relative a varie località (Cina, Sud Africa), suggerirebbe un evento globale che ha causato una perturbazione nel ciclo del carbonio.

DISENTAGLING LATE PERMIAN CONIFER LEAF CUTICLES: QUANTITATIVE ANALYSIS OF EPIDERMAL CHARACTERS AND TAXONOMIC CONSEQUENCES

Hartman J.D.[1], Duijnstee I.A.P.[2], **Kustatscher E.**[3,4],
van Konijnenburg-van Cittert J.H.A.[1], Looy C.V.[2]

[1] Laboratory of Palaeobotany and Palynology, Faculty of Geosciences, Utrecht University, Heidelberglaan 2, 3584 CS Utrecht;
[2] Department of Integrative Biology, Museum of Paleontology, University and Jepson Herbaria, University of California, Berkeley, 3060 Valley Life Sciences Building #3140, Berkeley, CA 94720-3140, USA;
[3] Museum of Nature South Tyrol, Bindergasse/Via Bottai 1, 39100 Bozen/Bolzano, Italy;
[4] Department für Geo- und Umweltwissenschaften, Paläontologie und Geobiologie, Ludwig-Maximilians-Universität, and SNSB Bayerische Staatssammlung für Paläontologie und Geologie, Richard-Wagner-Straße 10, 80333 Munich, Germany.

In the 1980s several late Permian conifer taxa have been described based on well-preserved cuticle remains from northern Italy. Recently, a new macrofossil horizon was described from the same area and coeval with the cuticle assemblage. This new flora included a rich assemblage of gymnosperm and spore plants (e.g. seed ferns, putative cycadophytes, ginkgophytes and sphenophytes). Approximately 40% of the gymnosperm-dominated floral assemblage is represented by well-preserved conifer leaves and shoots with cuticles. By combining plant macrofossils with their preserved cuticles, these new finds have the potential to elucidate the gross morphology of conifers that were hitherto only known from small remains and/or dispersed cuticles. In this study, we will focus on an integrated analysis of macrofossil remains and cuticles from the newly discovered locality. Three aspects will be emphasized, that together will shed light on voltzian conifer morphology and taxonomy: (1) quantitative comparison and classification of epidermal cell patterns in the cuticle material of identified macrofossils with previously described taxa from the same area; (2) assess which quantitative characters and their frequency distribution best separate existing taxa; and (3) re-evaluate existing conifer taxonomy based on preserved cuticles alone.

WHAT HAPPENED TO LAND PLANTS DURING THE END-PERMIAN MASS EXTINCTION?

Nowak H.[1], Kustatscher E.[1,2]

[1] Museum of Nature South Tyrol, Bindergasse/Via Bottai 1, 39100 Bozen/Bolzano, Italy;
[2] Department für Geo- und Umweltwissenschaften, Paläontologie und Geobiologie, Ludwig-Maximilians-Universität, und Bayerische Staatssammlung für Paläontologie und Geologie, Richard-Wagner-Straße 10, 80333 München, Germany.

The Lopingian (late Permian) to Early Triassic interval is marked globally by important changes in faunas and floras, most importantly the end-Permian mass extinction and subsequent recovery. Whether land plants also suffered a mass extinction at this time has not been entirely clear so far. In Lower Triassic successions, macrofossils of land plants are comparatively rare and mostly represent impoverished floras dominated by pleuromeiacean lycopsids. On the other hand, there is no shortage of spores and pollen grains, suggesting that there may be a taphonomic bias. In order to gain a more coherent picture of land plant macroevolution, global sporomorph and plant macrofossil occurrence records (from the existing literature and primary data) from the Wuchiapingian to the Ladinian have been collected and analysed in parallel. Our results indicate that the plant macrofossil record is biased regarding the Induan Stage and under-represents the standing diversity, leading to the impression of increased extinction. Spores and pollen do not show a significant loss of diversity across the Permian–Triassic boundary. While macro- and microfossil diversities differ, and while both have limitations, they do both individually and in their sum provide arguments against a mass extinction in plants as previously conceived.

Sesta sessione, chair Lorenzo Rook (Università degli Studi di Firenze)

MANAGING ALL FOSSILS: SUSTAINABILITY FOR ITALIAN SOCIETY AND CONTRIBUTION OF NEW INFORMATION TECHNOLOGIES

Martinetto E.[1], Caruso C.[2], Di Silvestro G.[3], Famiani F.[4], Quarantelli M.[5]

[1] Dipartimento di Scienze della Terra, Università degli Studi di Torino, Via Valperga Caluso 35, I-10125 Torino, Italy;
[2] via Scirò 2, I-88046 Lamezia Terme;
[3] CEO Trilobite Design Italia, strada stazione 20, I-34011 Duino Aurisina;
[4] via Monteverde 16, I-06029 Valfabbrica (PG);
[5] via Ambaraga 120, I-25133.

For the Italian law, "things concerning Palaeontology" are part of the State's cultural heritage, and should be preserved and promoted similarly to Pompeii. Yet most of the Italian palaeontological heritage is as poorly known to the general public as it is widespread. Plant fossils are a good example: we collected data in a 400 km^2 area, where the estimated minimum quantity of "things which concern Palaeontology" approaches 100.000.000 specimens. In contrast, a single public employee can dedicate some working time to study, preserve and promote such kind of fossils in Italy. The numbers would be astonishing if extended to the huge, fossil invertebrates rich, marine formations throughout Italy. A comprehensive preservation and enhancement plan of such a huge "fossil heritage" does not seem to be sustainable. Data for the budget assigned by the Italian State to take care of "things concerning Palaeontology" are poorly available and a consistent part has been devoted to the legal investigations against those people who collected fossils. We see the need of a change of attitude: the repression of crime should be paralleled by investments in new information technologies allowing both evaluating and enjoying fossils. We designed an innovative database, called “PaleoWikiApp”, for the needs of rapid in-situ evaluation of all fossils by officers, researchers and ordinary people, whose budget requirements are estimated in a few thousands Euros.

THE ITALIAN CULTURAL HERITAGE LAW AND ITS IMPACT ON PALEONTOLOGY IN ITALY

Orso J.

Via Bertinoro, 9/E, 20148 Milano.

The protection of the national paleontological heritage is a duty for every country. That is why the Italian law does not permit any fossil collecting activity. Paleontologists and universities need special permission to do any field-research. Private people don't get permission as they are not supposed to collect fossils at all. The law and its application obviously are the same for everyone, and don't allow for differences between destructive fossil collecting by "vandals", or fossil collecting by scientifically interested people doing private research, or by people just fascinated by the beauty and mystery of fossils. This situation understandably has led to a drastic decrease in interest, not only in fossils, but in paleontology itself, at least on behalf of the fossil fan community.

Why all that should be of interest to the Italian Paleontological Society (SPI), I will try to explain in my presentation, highlighting two different scenarios.

The current legal situation affects paleontology in different ways: Discoveries of interesting fossils have dramatically dropped, since most amateurs have stopped searching. Many important findings in the past were achieved by amateurs, as the professionals often lacked time and funds to go fossil hunting, and still do. It affects likewise the numbers of amatorial members of the SPI, because promoting membership is quite difficult under these circumstances. It obviously also affects visibility, which makes paleontology a misterious, if not completely unknown science to most of the Italian population. Any science needs the support not only of the government, but also of the people. The more the better. A good standing always helps when it comes to deciding about official fund assignments. Low visibility also easily leads to shrinking employment opportunities and consequently students will be inclined to consider a paleontological career as most difficult if not impossible to achieve, and look elsewhere.

Therefore finding a better way of protecting the Italian paleontological inheritance should be of paramount interest to the SPI. Who else could efficiently persuade the government of the importance of a better law?

ABSTRACT DEI POSTER

ARTICULATED TOOTH SETS OF *PTYCHODUS POLYGYRUS* AGASSIZ FROM THE UPPER CRETACEOUS OF NORTHESTERN ITALY

Amadori M.[1], Amalfitano J.[2], Giusberti L.[2], Fornaciari E.[2], Carnevale G.[3], Kriwet J.[4]

[1] Via Pilone 91/A, I-61030 Lucrezia di Cartoceto (PU);
[2] Department of Geosciences, University of Padova, Via Gradenigo 6, I-35131 Padova;
[3] Department of Earth Sciences, University of Torino, Via Valperga Caluso 35, I-10125 Torino;
[4] Department of Palaeontology, Geozentrum, University of Vienna, Althanstraβe 14, 1090 Vienna, Austria.

Ptychodus polygyrus Agassiz was a Late Cretaceous durophagous chondrichthyan mainly distributed in North America and Europe (Cappetta, 2012). Its fossil record is usually represented by isolated teeth and, more rarely, by articulated tooth sets, mineralized cartilages and vertebral centra. *Ptychodus polygyrus* is a species characteristic for its marked dental morphological variability. According to the recent study of Brignon (2015), the species was erected by Agassiz (1835) based on two isolated teeth, previously illustrated by Mantell (1822). Here, we consider two articulated specimens of *Ptychodus polygyrus* and associated/isolated teeth crucial to review this taxon. All the specimens have been found in hemipelagic deposits of Upper Cretaceous Scaglia Rossa of Veneto region. The first one, coming from the Lessini Mountains in the Verona Province, preserves a central portion of the lower dental plate, several associated teeth, a vertebral centrum and mineralized cranial cartilages with traces of scavenging. Some dental cusps are heavily worn. The second one is the only known specimen of *Ptychodus* with both articulated dental plates preserved within the same slab, associated with portions of mineralized cartilage and a vertebral centrum imprint. This fossil was found in 1913 in the surroundings of Gallio (Asiago plateau, Vicenza) and was originally described by Canavari (1916) as *Ptychodus mediterraneus*. In both the specimens, the upper teeth occlusal surface is flat, while an occlusal bulge characterizes the lower teeth. The species-specific characters are mostly evident on the central dental rows. It has been possible to distinguish the upper and lower symphyseal teeth. The goal of this work is the revision of *P. polygyrus* based on a detailed description of these two articulated teeth sets, also by comparison with other associated and isolated teeth all coming from Veneto region. The ongoing study will also give new valuable insights about the dignathic heterodonty of *Ptychodus*.

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LARGE MAMMALS FROM PODERE SAN LORENZO (PERUGIA, ITALY; EARLY PLEISTOCENE)

Azzarà B.[1], Breda M.[2], Brobia Ansoleaga A.[1], Buzi C.[3], Pandolfi L.[4], Pazzaglia F.[5], Cherin M.[1]

[1] Dipartimento di Fisica e Geologia, Università di Perugia, Via A. Pascoli, 06123 Perugia, Italy
[2] Dipartimento di Studi Umanistici, Università di Ferrara, Corso Ercole I D'Este 32, Ferrara 44100, Italy;
[3] Dipartimento di Biologia Ambientale, Sapienza Università di Roma, P.le A. Moro 5, 00185 Roma, Italy;
[4] Dipartimento di Scienze, Università degli Studi di Roma Tre, Largo S.L. Murialdo 1, 00146 Roma, Italy;
[5] Int.Geo.Mod. srl, Via Fratelli Cairoli 24, 06125 Perugia, Italy.

Most of the recent scientific works on fossil mammals from Umbria refers to the southwestern branch of the Tiber basin, thanks to the outstanding richness of paleontological sites scattered in the whole area. This portion of the basin extends from Perugia to Terni and corresponds to a well-defined half-graben filled with fluvial-lacustrine deposits.
In this study, we focus on the area of Deruta, a city about 20 km south of Perugia. The paleontological collection presented herein was discovered in the 1990s in a sand and gravel quarry at Podere San Lorenzo (PSL), east of Deruta. Unfortunately, the stratigraphic succession once exposed in the quarry is no longer visible and cannot be analyzed in detail. However, we describe here a new outcrop (Palazzone; PZ), which is not far from PSL and shows almost completely comparable facies associations. The overall sedimentological features of both the PZ and PSL sites can be referred to a fluvial depositional environment characterized by a gradual passage from predominant conglomerate to fine sandstone and siltstone (i.e. average reduction of the hydrodynamic energy) from the bottom upwards. The two outcrops are referred to the Madonna dei Bagni Lithofacies (Tiberino Supersyntheme - Todi Syntheme - Santa Maria di Ciciliano Subsyntheme; Early Pleistocene).
The preliminary analysis of the large mammal remains from PSL allowed to recognize the following taxa: *Sus strozzii* Forsyth Major, 1881, *Pseudodama nestii* (Azzaroli, 1947), *Leptobos* cf. *etruscus* (Falconer, 1859), *Equus stenonis* Cocchi, 1867, *Stephanorhinus etruscus* (Falconer, 1868), *Mammuthus* cf. *meridionalis* (Nesti, 1825). The faunal assemblage is typical of the early Late Villafranchian Land Mammal Age and can be referred to the Olivola/Tasso Faunal Units (about 2.0–1.8 Ma), in accordance with the age of some other assemblages found in the southwestern branch of the Tiber basin (e.g. Pantalla, Torre Picchio, Villa San Faustino).

CRANIAL VARIABILITY ON PLEISTOCENE AND EXTANT LIONS (*PANTHERA LEO* SSP.): A CASE STUDY

Bergamo A.[1], Fornaciari E.[2], Fornasiero M.[3], Ghezzo E.[4]

[1] Montebelluna, I-31044, (TV);
[2] Dipartimento di Geoscienze, Università degli Studi di Padova, Via Gradenigo 6, I-35131, Padova;
[3] Museo di Geologia e Paleontologia, Università degli Studi di Padova, Via Giotto 1, I-35121, Padova;
[4] www.paleogeographic.com, Venezia.

Since the first description of European lions by Goldfuss (1810) and von Reichenau (1906) as *Panthera leo fossilis* and *Panthera leo spelaea,* one of the main open debates among palaeontologists have dealed with in-group lion taxonomy.
In this presentation, we focus on the concept of species and subspecies within the genus *Panthera*, particularly for the Middle-Late Pleistocene European lion. We carried out an overview of several authors' conclusions, in order to summarize their different approach about such topic.
Molecular studies offer an important contribution to the disclosure of the taxonomic divergence and phyletic relationships of European lions but, as well as fossil evidences, researchers have not obtained a complete agreement among different results. Several authors focused their studies on mtDNA, suggesting an incomplete shift between extant and European lions. Instead, the codification of the mitochondrial genome by Barnett et al. (2016) seems to demonstrate that the cave lion was a distinct species.
We presented here a morphological study of two Late Pleistocene well preserved crania from the site of Pocala Cave (Aurisina - Trieste, Italy) that are part of the permanent exhibition of the Geological and Palaeontological Museum of the University of Padua. Our comparative sample includes extant *Panthera leo* specimens from several departments and museums of the University of Padua, Ferrara and Florence. Our statistical analysis includes cluster and principal component analyses. Our results suggest that extinct and extant species of lions share a quite similar morphology, with a high degree in the variability of cranial features. In this case, morphology vary within the group without a clear pattern, suggesting a morphological separation of European lions only at subspecific level.
To sum up, a larger amount of specimens is needed to obtain more consistent results from morphology, statistics and DNA.

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SMILODON FATALIS HOUSED IN THE GEOLOGICAL AND PALAEONTOLOGICAL MUSEUM OF THE UNIVERSITY OF PADUA

Bergamo A.[1], Ghezzo E.[2], Fornasiero M.[3], Gatto R.[4]

[1] Montebelluna, I-31044, (TV);
[2] www.paleogeographic.com, Venezia;
[3] Museo di Geologia e Paleontologia, Università degli Studi di Padova, Via Giotto 1, I-35121, Padova;
[4] Dipartimento di Geoscienze, Università degli Studi di Padova, Via Gradenigo 6, I-35131, Padova.

Smilodon fatalis (Leidy, 1868) was a large North American Pleistocene machairodontine felid. The history of the skeleton of *S. fatalis* on exhibit at the Geological and Palaeontological Museum of the University of Padua has been investigated. The skeleton comes from the Late Pleistocene site of Rancho La Brea (California, USA). Researches carried out on archive documents attest that the composite skeleton was donated in 1933 by the Museum of Palaeontology of the University of California, Berkeley, in exchange for remains of a cave bear from Northeastern Italy. Code numbers written on the bones of the skeleton provide evidence that the *Smilodon* remains were recovered from three different La Brea tar pits during the excavations carried out between 1906 and 1913 by the University of California. The skeleton is the only complete original specimen of *Smilodon* housed in an Italian museum and one of the few existing in European collections.
A morphological comparison between the skeleton of *S. fatalis*, the cranial and post-cranial remains of the European machairontine felid *Homotherium latidens* (Owen, 1846) from the Lower Pleistocene site of Pirro Nord (Apricena, Puglia, Italy), housed at the Palaeontological Museum of the University of Florence, and the extant lion *Panthera leo* (Linnaeus, 1758) has been carried out. Both machairodonts show morphological similarities (retracted nose, small brain-case with a straight dorsal profile, robust metacarpal bones, etc.) and substantial differences compared to *P. leo* (greater sagittal crest, more prominent upper incisors, more elongated and laterally flattened upper canines, greater carnassial teeth, more developed processes of the cervical vertebrae, stronger forelimbs, shorter tail, etc.). All the differences have been interpreted from an ecological and evolutionary point of view and confirm the hypothesis of a different locomotor and hunting behaviour between the machairodonts and the extant lion.

SAUROPOD TEETH FROM THE LATE CRETACEOUS OF MADAGASCAR: A COOL TOOL TO ESTIMATE SAUROPOD BIODIVERSITY

Bindellini G., Dal Sasso C.

[1] Museo Civico di Storia Naturale di Milano, C.so Venezia, 55 – 20121, Milano.

With this contribution we illustrate the preliminary results of a detailed study conducted on 30 sauropod fossil teeth. The specimens are deposited in the paleontological collections of the Museo di Storia Naturale di Milano (MSNM) and come from the central portion of the Mahajanga Basin, NW Madagascar, namely from sedimentary layers referable to the Maevarano Formation, which is dated back to the Late Cretaceous Maastrichtian stage. For each specimen we selected and measured several significant parameters, paying particular attention to the description of wear facets, enamel wrinkling and cross-section variation. The latter character was studied through 3D models generated with a macro-photogrammetry method. Based on this detailed morphological dataset, seven morphotypes can be recognised. These are referred to three titanosaurian taxa: *Rapetosaurus krausei, Vahiny depereti,* and possibly a new species, here provisionally nicknamed "Malagasy taxon C". The latter is represented by 13 well–preserved teeth that display a unique combination of anatomical features, including marginal wear facets and a cross-section that, approaching the apex, becomes labio-lingually compressed, showing a faint spatulation and a "lemon-like" profile. These are basal characters, unusual for a Maastrichtian titanosaur, but quite common in non-Titanosauria Titanosauriformes (e.g., *Huabeisaurus allocotus*). In facts, this possible new species could represent the first evidence of a relictual basal titanosaur taxon, a Malagasy endemism that survived until the end of the Cretaceous.

PALEOCARTA DEL VALDARNO: UN NUOVO STRUMENTO PER LA DIDATTICA E LA RICERCA

Borrani A.[1], Faraoni M.[2,3], Franci D.[3], Savorelli A.[4]

[1] Università degli Studi di Palermo, Dipartimento di Scienze della Terra e del Mare (DISTEM), via Archirafi 22, 90123 Palermo, Italy;
[2] Università degli Studi di Siena, Dipartimento di Scienze Storiche e dei Beni Culturali (DSSDC), Laboratorio di informatica applicata alla ricerca preistorica (LIARP), via Roma 56, 53100 Siena, Italy;
[3] Museo Paleontologico dell'Accademia Valdarnese del Poggio, Via Poggio Bracciolini 36/40, Montevarchi 52025, Italy;
[4] Università degli Studi di Firenze, Dipartimento di Scienze della Terra, via la Pira 4, 50012 Firenze, Italy.

Il bacino del Valdarno superiore è famoso per la grande quantità di resti di mammiferi che ha prodotto fin dal Rinascimento. In questa area sono stati rinvenuti esemplari che sono stati poi scelti come tipi di molte specie europee del Pliocene medio-superiore (~ 3 Ma) e del Pleistocene inferiore (~ 2 - 1.5 Ma). Al fine di valorizzare tale patrimonio fossile, nasce la "Paleocarta del Valdarno", un progetto sviluppato dal Museo Paleontologico di Montevarchi. Il lavoro ha previsto lo sviluppo di due carte distinte: la prima è destinata principalmente alla didattica ed alla valorizzazione del territorio, mentre la seconda è rivolta per lo più agli specialisti, e include il catalogo *on-line* dei reperti paleontologici custoditi presso il Museo. A loro volta le carte sono suddivise nelle tre fasi di popolamento delle faune: ca. 3.0 Ma, tra circa 2.0 e 1.5 Ma e tra circa 300 e 100 ka. Per la realizzazione delle carte è stato utilizzato il software di tipo Gis "Qgis", al cui interno sono stati inseriti i dati relativi alle curve di livello e le suddivisioni degli ambiti comunali tratti dal sito di informazione geografica della regione Toscana. La cartografia di base è stata ripresa da Openstreetmap tramite il plug-in Qgis2web, utilizzato anche per l'esportazione in formato *web*, per la creazione di *pop-up* e per le legende. La geolocalizzazione dei reperti è stata effettuata grazie ai dati toponomastici provenienti dai cataloghi di inventario del Museo e collocati poi nei rispettivi giacimenti tramite l'identificazione della posizione attraverso il portale RETORE, il database Repetti On-line e la consultazione delle carte tecniche presenti nel Geoscopio. Entrambe le tipologie di carte prodotte sono di libero accesso e consultazione, condivisibili sui principali *social network* e stampabili; è stata inoltre prevista la possibilità di registrazione al portale, allo scopo di creare un *network* per mettere in contatto i ricercatori.

A PARACLUPEID FISH (TELEOSTEI, CLUPEOMORPHA, ELLIMMICHTHYIFORMES) FROM THE EOCENE OF MONTE BOLCA: THE YOUNGEST MARINE RECORD OF DOUBLE-ARMORED HERRINGS

Carnevale G.[1], Marrama' G.[2], Bannikov A.F.[3], Kriwet J.[2]

[1] Dipartimento di Scienze della Terra, Università degli Studi di Torino, Via Valperga Caluso, 35 10125 Torino, Italia;
[2] Department of Palaeontology, University of Vienna, Althanstrasse 14, 1090 Vienna, Austria;
[3] Borisyak Paleontological Institute of the Russian Academy of Sciences, Profsoyuznaya 123, Moscow 117647, Russia.

Double-armored herrings of the order Ellimmichthyiformes constitute an extinct clade of clupeomorph fishes with a broad paleogeographic and paleoenvironmental distribution in marine, estuarine and freshwater deposits worldwide. This clade comprises more than 40 species spanning from the Early Cretaceous to the Middle Eocene. After the end-Cretaceous mass extinction and until their final extinction, double-armored herrings experienced a drastic drop in their diversity and disparity, with the Paleogene taxa being restricted in the freshwaters of North and South America and China. A new double-armored herring is documented based on a single partially complete specimen from the Early Eocene Pesciara site of the Monte Bolca Konservat-Lagerstätte, north-eastern Italy. The fossil is characterized by a unique combination of features that supports its recognition as a new genus and species of the family Paraclupeidae, including ornamentation of the skull bones, medial fusion of the contralateral halves of the neural arches of the abdominal vertebrae, presence of teeth on the endopterygoid, parhypural fused to the first preural centrum, presence of a short series of six predorsal scutes increasing in size posteriorly, and postpelvic scutes bearing very prominent spines. The phylogenetic analysis (62 morphological characters coded for 32 taxa) suggests that new paraclupeid taxon from Monte Bolca documented is closely related to the Early Cretaceous freshwater genus *Ellimmichthys* from the Western Gondwana rift basins. Moreover, it represents the youngest marine occurrence of the family Paraclupeidae and, more generally, of the order Ellimmichthyiformes, suggesting that the shallow marine biotopes of the western Tethys might have favoured the persistence of certain fish lineages that were severely affected by the end-Cretaceous mass extinction.

INTERACTION BETWEEN CARBON CYCLE PERTURBATIONS AND MARINE CALCAREOUS ORGANISMS: THE APTIAN-SANTONIAN EVOLUTION OF THE NORTHWESTERN FRIULI PLATFORM MARGIN (SOUTHERN ALPS, NE ITALY)

Cobianchi M.[1], Luciani V.[2], Picotti V.[3]

[1] Dipartimento di Scienze della Terra e dell'Ambiente, Università degli Studi di Pavia, via Ferrata 1, I-27100 Pavia;
[2] Dipartimento di Fisica e Scienze della Terra, Università degli Studi di Ferrara, via Saragat 1, I-44121 Ferrara;
[3] Earth Sciences Department, ETH Zurich, Sonneggstrasse 5, 8092 Zurich, Switzerland.

The dynamics of the carbonate sedimentary system have a fundamental role in the Earth's climate changes as they exert a major influence on the global carbon cycle. The calcium carbonate production and preservation into the sediments significantly affect the ability of the oceans, the main carbon reservoir, to buffer the excess of atmospheric CO_2. Carbonate production is strongly related to the evolution of marine benthic and planktonic organisms secreting carbonate shells: the evolutionary or ecological events affecting shallow-water marine calcareous organisms markedly influenced the architecture of the carbonate sedimentary system.
The Cretaceous is a crucial interval of the Earth's history being marked by significant changes in the global carbon cycle. This period is characterized by major paleoceanographic events testified by widespread deposition of organic-rich shales that are the sedimentary expression of Oceanic Anoxic Events (OAE). We present here the case-history of the Cretaceous Friuli carbonate platform margin (northwestern Italy) in order to identify the relationship between the global signal of the OAE and the evolution of the platform. No backstepping or drowning events of the platform margin are recorded at the OAEs 1a and 2. On the contrary, the main change in the margin geometry is observed in the uppermost Albian, probably close to the OAE 1d. The Cenomanian record in the Cellina section documents a transition from a rimmed platform margin, dominated by corals, green algae, benthic foraminifera, rudists (late Albian) to an open ramp environment (from Cenomanian to Santonian) with evidence of pelagic sedimentation. Because of the development over a previously rimmed platform as well as the occurrence of breccias and turbiditic structures on the slope, the ramp has been interpreted as a distally steepened ramp where the carbonate factory is dominated by microbial activity.

CONODONT FAUNA FROM THE LOWER TRIASSIC OF THE AL MAMALIH AREA, DEAD SEA, JORDAN

Crippa C.P.

Dipartimento di Scienze della Terra "Ardito Desio", Università degli Studi di Milano, Via Luigi Mangiagalli 34, 20133 I-Milano.

Here, I present the conodont fauna from the Lower Triassic succession of the Al Mamalih area, south of Wadi ad Dab, Eastern coast of the Dead Sea, Jordan. The analyzed samples are from the Ma'In Formation that represents a marine transgression event in a marine-marginal environment. The formation comprises, in upward sequence, the Himara Member and the Nimra Member. The conodont fauna is from samples collected at the base of the Nimra Member, in the Al Mamilah Graben section 2 (Powell *et al.,* 2016). The fauna is abundant and consists mainly of *Hadrodontina aequabilis* (Staesche, 1964) and *Hadrodontina agordina* (Perri & Andraghetti, 1987) elements, together to other fossil remains (gastropods, foraminifers, bivalves). Moreover, a single specimen of *Hindeodus postparvus* Kozur, 1990 has been found. The alteration index C.A.I. (Conodont Alteration Index, Epstein *et al.* 1977) of the conodonts is 1 and it can be estimated that the maximum temperature reached by the sedimentary succession was between <50°C and 80°C. The conodont fauna is linked to the *aequabilis* Zone of Perri and Farabegoli (2003) and therefore late Induan in age. This conodont fauna allows correlations with the Southern Alps, China, Malaysia, Transcaucasia and Slovenia.

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STATISTICAL ANALYSIS OF A COMPLEX TRIASSIC SUBHOLOSTEAN GROUP: NEW APPROACHES TO THE TAXONOMY OF *PELTOPLEURUS* FROM THE MERIDE LIMESTONE (CH)

Franceschi F., Masini S.

Dipartimento di Scienze della Terra "Ardito Desio", Università degli Studi di Milano, Via Luigi Mangiagalli 34, 20133 I-Milano.

The genus *Peltopleurus*, erected by Kner in 1866, is found in Middle and Upper Triassic marine sediments from Europe and China: it comprises tiny bony fishes with primitive skull, caudal fin with a short body lobe bearing epaxial fin rays, typical greatly deepened medium-lateral scales and modified anal fin in supposed males. Since the erection of the genus, the nonstop recovery of these organisms has significantly increased the number of the described species, mainly because of their remarkable intra-generic morphological variability. This characteristic has been translated into taxonomy by means of morphological approach, but the systematic is nowadays complex and confused. This makes necessary to review the systematic of *Peltopleurus* together with reconsidering its palaeoecology. The specimens studied here come from the Monte San Giorgio UNESCO site (Italy-Switzerland boundary), particularly from "Kalkschieferzone", upper part of Meride Limestone (upper Ladinian, Middle Triassic): *Peltopleurus* is here common and shows its peculiar variability. Different methodologies, based on the analysis of objectively measurable variables, are tested here starting from the heights of the greatly deepened medium-lateral scales: this character clearly shows the variability of the genus and, at the same time, it's most likely to be found also in not well-preserved specimens. Three approaches are applied: spatial-statistic, a non-hierarchical clustering method; principal component analysis, a well-established hierarchical clustering method; geometric morphology. The tested methodologies remarked the impossibility of discriminating specimens into useful groups, confirming at the same time the mosaic-like distribution of characters within specimens. Comparing the different results obtained here with the traditional classification no notable analogies are observed: for these reasons, the necessity of a systematic revision is desirable, pointing to a reduction in number of species.

HYSTRIX (MAMMALIA, RODENTIA) FROM OLDUVAI GORGE (EARLY PLEISTOCENE)

Fressoia L.[1], Masao F.T.[2], Menconero S.[3], Mori E.[4], Cherin M.[1]

[1] Dipartimento di Fisica e Geologia, Università di Perugia, Via A. Pascoli, 06123 Perugia, Italy;
[2] College of Humanities Archaeology and Heritage, University of Dar es Salaam, P.O. box 35050 Dar es Salaam, Tanzania;
[3] Dipartimento di Storia, Disegno e Restauro dell'Architettura, Sapienza Università di Roma, Piazza Borghese 9, 00186 Roma, Italy;
[4] Dipartimento di Scienze della Vita, Università di Siena, Via P.A. Mattioli 4, 53100 Siena, Italy;

The rodent family Hystricidae includes three extant genera (*Trichys*, *Atherurus*, and *Hystrix*) and eleven species, ranging from Asia to Africa and to Italy. This family probably originated in Asia and dispersed in Europe and Africa starting from the middle-late Miocene. Several fossil species are reported from the middle Miocene to the early Holocene.
Five species of the subfamily Hystricinae occurred in Africa in the late Pliocene and Pleistocene: the extinct *Hystrix leakeyi*, *H. makapanensis*, and *Xenohystrix crassidens* and the still living *H. africaeaustralis* and *H. cristata*. Among them, *H. leakeyi* has the smallest body size, followed by the similar *H. africaeaustralis* and *H. cristata*, the medium-sized *H. makapanensis*, and the "giant porcupine" *X. crassidens*. The occlusal surfaces of cheek teeth of these species are different and exhibit a number of diagnostic morphological characters which are useful for taxonomic purposes.
In this work, we describe a new porcupine mandible from the world-renowned paleontological and archaeological site of Olduvai Gorge in Tanzania, collected by the University of Perugia Olduvai Project (UPOP). The specimen was found in the HWK archaeological site (Geolocality 43), in deposits referable to the lower Bed II, i.e. dated at about 1.7 Ma, when the Olduvai area was still occupied by a wide alkaline lake. The morphological and morphometric analysis support referring the mandible to the late Pliocene-early Pleistocene species *H. makapanensis*. However, we identified some differences in mandibular and lower tooth morphology between the *H. makapanensis* samples from Tanzania and South Africa, which require further studies to confirm (or disprove) their attribution to the same species.

EOCENE ENIGMATIC SPONGE-LIKE SPECIMENS FROM THE EASTERN LESSINI MOUNTAINS (NE ITALY)

Frisone V.[1], Pisera A.[2], Papazzoni C.A.[3], Beschin C.[1], Preto N.[4]

[1] Museo di Archeologia e Scienze Naturali 'G. Zannato',Piazza Marconi 17, I-36075 Montecchio Maggiore, Italy;
[2] Instytut Paleobiologii, Akademii Nauk, Twarda 51/55, P-00-818 Warsawa, Poland;
[3] Dipartimento di Scienze Chimiche e Geologiche, Università degli Studi di Modena e Reggio Emilia, Via Campi 103, 41125 Modena, Via Campi 103, I-41125 Modena, Italy;
[4] Università degli Studi di Padova, Dipartimento di Geoscienze, Via Gradenigo 6, I-35131 Padova, Italy.

The "G. Zannato" Museum of Montecchio Maggiore (Vicenza province, Italy; www.museozannato.it) houses a small collection of unpublished Eocene sponge-like specimens from the Braggi quarry, Vestenanova (Verona province). The Braggi quarry (Beccaro, 2003; Beschin et al., 2015) is just a few kilometres from the word-wide known Fossil-Lagerstätten of Bolca.
The specimens are catalogued as "siliceous sponges". In order to determine the taxonomy of the specimens, a study was started both on the Museum collections and in the field. The field work was performed to build a stratigraphic log and to collect new samples, then treated to obtain thin sections, washed residues, and smear slides. The external morphology of the specimens was described using a caliper, hand lense and binocular microscope. The internal features of the specimens were investigated by transmitted light microscopy on thin sections.
The Museum specimens are cylindrical, globlose or subglobose in shape, with a diameter ranging from 8 to 30 cm, a wall thickness of 2.5-13 cm, a circular –subcircular opening (?apical osculum) 3-7 cm in diameter, and a central cavity (?spongocoel). The thin sections observations revealed that the body of the fossils was replaced by a grainstone with larger foraminifera (nummulites, orthophragmines, alveolines, etc.), small miliolids, coralline algae, echinoderm fragments, and gastropods. No sponge spicules were observed neither in thin sections nor in washed residue.
In the field, albeit not *in situ*, a large limestone (grainstone-rudstone) of 39x95x26 cm slab carrying sponge-like specimens was found. The sponge-like specimens were generally cylindrical with a large apical opening (?)osculum and a central cavity (?)spongocoel. The specimens were one aside the other, some of them were upright, some overturned. The specimens were embedded in a gray tuffite that occurred also inside central cavity.
The observed features may indicate that the specimens could be natural casts of "soft" demosponge (as Keratosa, class Demospongiae Sollas, 1885) or lyssacinosid sponges (class Hexactinellida Schmidt, 1870). However, we cannot exclude they could be concretions of unknown origin.

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MICROBIALITES CONTROL THE DOLOMITIZATION PROCESSES IN CARNIAN PATCH REEFS AT RIFUGIO VALLANDRO, DOLOMITES, ITALY

Guido A., Russo F., Mastandrea A.

Dipartimento di Biologia, Ecologia e Scienze della Terra, Università della Calabria, Via Bucci, cubo 15b, 87036 Rende, Cosenza, Italy.

Rifugio Vallandro section shows faunal content and facies patterns similar to those of the Carnian erratic boulders of Alpe di Specie (South Tyrol, Italy). The section contains at least three frame-builder horizons, in part constituted by deeply dolomitized boundstone, with corals (*Retiophyllia* sp. and other indeterminable colonial forms) in life position, sponges (*Colospongia* sp., *Eudea* sp.), chaetetids and stromatoporoids. Peloidal crusts and aphanitic fine texture, showing organic matter relics, suggest microbial mediated mineralizations. Geomicrobiological characterization of microbialites from Alpe di Specie indicates the presence of Sulfate Reducing Bacteria biomarkers, the lack of specific molecules typical of cyanobacteria, and REE consistent with suboxic conditions. These data suggest low energy depositional conditions and well-developed skeletal framework, that created protected low-oxygen micro-habitats. The SRB biomarkers can be linked to the associated clotted-peloidal fabrics, which resemble those commonly present in younger coral-reef frameworks. Similar processes could be hypothesized for the primary fine carbonate matrix of Rifugio Vallandro patch reefs. Two components can be distinguished in this fraction on the basis of the grain size: aphano- and coarse crystalline textures. Remains of peloidal fabric are still observable. The sample suffered pervasive dolomitization. Particularly, the frame-building (patch reefs) horizons are recrystallized, with the micrite substituted by fine dolomite and the skeletons by blocky coarse crystalline calcite. Trace of organic matter allows to attribute the aphano-crystalline dolomite to the primary autochthonous micrite (microbialite), while the coarse-crystalline dolomite seems to derive from the primary allochthonous micrite, for the presence of large amount of siliciclastics and the absence of organic remains. The study on the control of dolomitization processes by the different primary micrites could open a new window on the interpretation of dolomitized bioconstructions.

NEOGENE ASTROPECTINIDS OF ITALY AND EXTANT FORMS OF THE MEDITERRANEAN SEA: A PRELIMINARY REAPPRAISAL

Jaselli L.[1], Collareta A.[2]

[1] Museo di Storia Naturale "Antonio Stoppani", via Papa Pio XI, 32 - 21040 Venegono Inferiore (VA);
[2] Dipartimento di Scienze della Terra, Università di Pisa, via Santa Maria 53, 56126 Pisa.

Astropectinidae represent the largest family of extant Asteroidea. Within this family, the genus *Astropecten* including more than two fifths of the total number of species. Although most astropectinids occur in cold waters, various species of *Astropecten* currently inhabit the Mediterranean Sea, namely: *Astropecten aranciacus* (Linnaeus, 1758); *A. jonstoni* (Delle Chiaje, 1827); *A. irregularis* (Pennant, 1777); *A. spinulosus* (Philippi, 1837); *A. bispinosus* (Otto, 1823), and *A. platyacanthus* (Philippi, 1837).

These extant forms share several morphological characters with some fossil individuals referred to the same genus. Indeed, since the mid-XIX Century, several authors described complete astropectinids specimens from the Neogene marine sediment exposed in Central and Northern Italy. The earliest mentioned in literature is the holotype and only known specimen of *Crenaster montalionis* Meneghini 1852 from Montaione (FI). This specimen is currently subject of redescription and taxonomic re-evaluation by the authors of the present study.

Cavara (1866) and Sacco (1893) illustrated *A. bononiensis* Cavara, 1866, *A.* cf. *bispinosus* Otto, 1823 and *Astropecten* sp. all from the Piacenzian outcrops of the Asti Province. Del Prato (1896) described the new species *A. linati* Del Prato, 1896 from the Mio-Pliocene deposits of the Parma Province as well as *Astropecten* sp. from the Langhian beds of Gombio (RE); this specimen was later referred by Borghi & Bajo Campos (2008) to *Astropecten* cf. *forbesi* Heller, 1858.

Moreover, after a huge gap, Repetto & Bicchi (2013) described *Astropecten* cf. *irregularis pentacanthus* Delle Chiaje, 1825 from the muddy clay outcrops of Cherasco (AT).

HISTOLOGICAL STUDY OF SAUROPOD DINOSAUR BONES FROM THE HISTORIC UPPER JURASSIC HOWE QUARRY (WYOMING, USA) CONFIRMS THE PRESENCE OF INDIVIDUALS OF VARIOUS ONTOGENETIC STAGES.

Moretti J.[1], Tschopp E.[2], Barta D.[2], Waskow K.[3], Norell M.[2]

[1] Dipartimento di Scienze Chimiche e Geologiche, Università di Modena e Reggio Emilia, via Giuseppe Campi 103, 41125 Modena, Italy;
[2] American Museum of Natural History, Central Park West & 79th street, New York, NY, USA;
[3] Steinmann institute for Geology, Mineralogy and Paleontology, University of Bonn, Nussallee 8, 53113 Bonn, Germany.

The Howe Quarry in the vicinity of Shell (Wyoming, USA) is one of the richest occurrences of sauropod bones in the Upper Jurassic Morrison Formation. Excavations in 1934 by the American Museum of Natural History (New York, USA) and in 1990 and 1991 by the Sauriermuseum Aathal (Aathal, Switzerland) produced approximately 3000-4000 bones. The majority of the recovered specimens are sauropod dinosaurs, most of them belonging to the clade Diplodocidae.
Herein, we 3D-scanned dorsal ribs and long bones before sectioning in order to produce scalable models for body size estimation. Subsequently, thin sections were cut from seven ribs of different sizes and one fibula. The thin sections were analyzed under a microscope to identify lines of arrested growth (LAGs) and potentially an external fundamental system (EFS), and to determine the extent of remodeling through counting the generations of secondary osteons and the general texture of the bone.
The first results show a that most of the studied specimens are strongly remodeled, with some specimens even showing secondary osteons up to the outer-most bone layers. The number of visible LAGs varies between zero and eight. Three specimens have an identifiable EFS, indicating that they were skeletally mature. The smallest specimen shows a coarse-grained, highly irregular pattern, which could be indicative of its skeletally immature ontogenetic stage. Histology thus confirms the presence of specimens of a wide range of ontogenetic stages in accordance with the different dimensions of the original bones.

AMBRA DAL TRIASSICO MEDIO DEL SUDALPINO: IMPLICAZIONI PALEOCLIMATICHE E PALEOEVOLUTIVE

Roghi G.[1], Kustatscher E.[2,3], Angelini I.[4], Giusberti L.[5], Ragazzi E.[6]

[1] Istituto di Geoscienze e Georisorse, CNR, Via Gradenigo 6, I-35131 Padova, Italy;
[2] Museum of Nature of South Tyrol, 39100 Bozen/Bolzano (BZ), Italy;
[3] Department für Geo- und Umweltwissenschaften, Paläontologie und Geobiologie, Ludwig-Maximilians-Universität, und Bayerische Staatssammlung für Paläontologie und Geologie, Richard-Wagner-Straße 10, 80333 München, Germany;
[4] Dipartimento dei Beni Culturali, Università di Padova, Piazza Capitaniato 7, 35139 Padova, Italy;
[5] Dipartimento di Geoscienze, Università di Padova, Via Gradenigo, 6, I-35131 Padova, Italy;
[6] Department of Pharmaceutical and Pharmacological Sciences, University of Padova, L.go Meneghetti 2, 35131 Padova, Italy.

Il ritrovamento di ambra in alcune località del Triassico del Sudalpino rappresenta un punto di riferimento a livello mondiale sia per l'antichità che per le relazioni tra le piante produttrici ed il clima.
La più importante testimonianza di resina fossile triassica è l'ambra delle Dolomiti, proveniente dai livelli carnici della Formazione di Heiligkreutz. La si ritrova (i) in gocce e grani dispersi, spesso in stretta associazione a cuticola fossile e (ii) associata a faune a *Trigonodus* in matrice arenitica. Della stessa età è anche l'ambra proveniente dalle Alpi Giulie, molto più rara ma conservata in associazione con diversi macroresti di conifere. Questo intervallo carnico caratterizzato da abbondante quantità di resina fossile corrisponde ad un ben preciso e studiato evento climatico chiamato *Carnian Pluvial Event* (CPE).
Sporadiche segnalazioni di resina fossile più antica di quella carnica provengono dalle Prealpi Venete e sempre dalle Dolomiti.
Negli strati a *Voltzia* di Recoaro (Vicenza), di età anisica (Triassico Medio), associate a fronde appartenenti a voltziali, sono stati trovati alcuni granuli di ambra. I campioni appartengono a collezioni storiche e sono conservati nei Musei di Storia Naturale di Venezia e di Verona.
Inoltre, in un campione conservato presso il Museo di Storia Naturale di Vienna, proveniente dagli Strati di Wengen "Wengener Schichten" delle Dolomiti, corrispondenti al Ladinico (Triassico Medio), sono stati individuati granelli di resina fossile sempre associati ad una fronda di *Voltzia*.
Tutti questi ritrovamenti, sia abbondanti (Carnico), sia sporadici (Anisico e Ladinico), poiché in stretta affinità con macroflore, permettono di approfondire gli aspetti evolutivi delle conifere durante il Triassico e di coprire parzialmente il gap nel record dell'ambra dal Carbonifero al Giurassico.

HYBODONT SHARKS FROM JURASSIC PCP-BASIN SYSTEMS OF UMBRIA-MARCHE APENNINE

Romano M.[1,2,3], Citton P.[2,3,4], Fabbi S.[2,3], Cipriani A.[2,3]

[1] Evolutionary Studies Institute (ESI), School of Geosciences, University of the Witwatersrand, Johannesburg , South Africa;
[2] Dipartimento di Scienze della Terra, Sapienza Università di Roma, Piazzale A. Moro 5, 00185, Rome, Italy;
[3] AT Apennine Team;
[4] CONICET - Instituto de Investigación en Paleobiología y Geología, Universidad Nacional de Río Negro, Av. Roca 1242 (8332), General Roca, Río Negro province, Argentina.

The Umbria-Marche-Sabina (hereafter UMS) Domain in Central and Northern Apennines hosts a Upper Triassic to Neogene sedimentary succession recording a rifting stage occurred by the late Hettangian, dismembering a Bahamian-type carbonate platform. Tectonic subsidence and palaeoceanographic/palaeoecological perturbations diachronically led to the drowning of the benthic factory, triggering the onset of different styles of sedimentation in PCP-basin systems up to the deposition of the Maiolica Fm. since the Tithonian p.p. The new topographic configuration enabled burgeoning trophic niches available both for the vertebrate and invertebrate fauna. While the invertebrate fossil record of the UMS Domain is wealthy, vertebrate remains are relatively less represented and, thus, to date under-investigated. Three specimens consisting of teeth attributed to hybodont sharks are here discussed. Two specimens are isolated teeth referred to as *Asteracanthus* sp. coming from early Toarcian (Bifrons Zone) red marly-limestone of the Rosso Ammonitico Fm. (Polino, Umbria, Italy). The third specimen comes from the "Bugarone superiore Fm." of the Monte Nerone PCP (Piobbico, Marche, Italy). It consists of five teeth in anatomical connection and some fragments referred to as *Asteracanthus* cf. *A. magnus*. In the Mesozoic, hybodont sharks dominated a wide range of ecological niches, displaying many different dentition patterns and lifestyles. On the whole, the teeth here reported fit well a dentition pattern known as "Type broyeur", typical of extreme crushing feeding behaviour, characterizing Jurassic hybodont sharks feeding on the seafloor. The genus *Asteracanthus* has a cosmopolitan distribution in the Jurassic of Tethys and has been reported from several palaeoenvironments; in the present case, the taxon is related to open marine settings. By considering the invertebrate fauna that inhabited PCP-basin contexts of UMS Domain, potential prey living on the sea-floor are ostreids, limids, terebratulid brachiopods, gastropods and crustaceans. Zooxanthellate corals from several PCP-top and basin-margin condensed successions indirectly extend the in-depth *Asteracanthus* outreach to more than 100 m, increasing the range depth previously reported for this taxon.

THE CAVE BEARS FROM THE GROTTA DEL CERÈ (VERONA, VENETO REGION): A COMPLETE OVERVIEW

Rossi M.[1], Zorzin R.[1], Milani C.[2], **Santi G.**[2]

[1] Museo Civico di Storia Naturale, Lungadige di Porta Vittoria 9, I-37100 Verona, Italy;
[2] Dipartimento di Scienze della Terra e dell'Ambiente Università di Pavia, Via Ferrata 1, I-27100 Pavia, Italy.

The Grotta del Cerè is situated near the village of S. Anna d'Alfaedo (Verona) and opens 750 m a.s.l. next to a slope that characterizes the right side of Vajo dei Falconi. Three species of *Ursus* (*deningeri*, *spelaeus* and *arctos*), have been found here, and it is also probable that these fossils illustrate the complete evolutionary line of the cave bear and allows an evaluation of how these species changed over time. In the *U. spelaeus* of Cerè, the most important feature is the preservation of a rather simple dental morphology in which the more complicated morphotypes are absent (i.e. in the $P^4/_4$ and m_1), the latter on the contrary are present inside the more recent forms (*U. ingressus*), particularly in the populations of the eastern Europe, and of Northern Alps. The morphologic features, and in particular those of the teeth, show the preservation in the Cerè population, of important ancestral characteristics typical of the most ancient forms and/or of less specialized ones, to which *U. deningeri* and *U. spelaeus* (*sensu* Rabeder) belong. The analyses of the fossils coming from Grotta del Cerè and Covoli di Velo also show a lower degree of differentiation (conservative features) than the more specialized forms (*U. ingressus*) that inhabited the central-eastern regions of Europe. In the case of the Grotta del Cerè the m_1 provides similar indications (the convergence index of the cusps are similar to those typical of the Middle Pleistocene). On the contrary, the penetration of the more specialized forms seems limited to the western sector of the Alps. The data extracted particularly from Grotta del Cerè seem to confirm the existence of local evolutionary tendencies as a consequence of the alternation in geographic periods of both isolation and crossbreeding that genetic studies link to climatic oscillations of the Quaternary. The problem is to understand if the oscillations acted on the migratory ability of the species as well and on the evolutionary dynamics utilizing both genetic and the dating analyses.

IL NUOVO LABORATORIO DIDATTICO DI PALEONTOLOGIA E STRATIGRAFIA DEL DIPARTIMENTO DI SCIENZE DELLA TERRA E DELL'AMBIENTE DELL'UNIVERSITÀ DI PAVIA

Santi G.[1], Lualdi A.[1], Ronchi A.[1], Mancin N.[1], Lupi C.[1], Galli C.[2], Sanguini G.[1], Cobianchi M.[1]

[1] Dipartimento di Scienze della Terra e dell'Ambiente Università di Pavia, Via Ferrata 1, I-27100 Pavia, Italia;
[2] Museo Civico di Storia Naturale, Via Ugolani Dati 4, I-26100 Cremona, Italia.

Il nuovo Laboratorio di Paleontologia e Stratigrafia è in parte l'evoluzione del Museo dell'Istituto di Geologia (oggi Dipartimento di Scienze della Terra e dell'Ambiente) dell'Università di Pavia la cui storia è intimamente legata a quella dell'Istituto stesso fin dalla sua istituzione (1887) sotto la direzione di T. Taramelli. Nel tempo le collezioni soprattutto paleontologiche si arricchirono con materiale frutto di acquisizioni e scambi, o direttamente raccolto dai vari ricercatori, e composte con fossili provenienti dalle più note località fossilifere europee e italiane, come numerosi resti da Solnhofen e dal Bacino di Parigi; le graptoliti ordoviciane provenienti dalla Sardegna da località ormai non più rintracciabili; i pesci dell'Eocene da Bolca. Quest'ultima collezione (65 esemplari) fu poi studiata da S. Volta nella sua monumentale "Ittiologia Veronese" (1796). L'incremento maggiore delle collezioni paleontologiche avvenne con fossili di mammiferi pleistocenici (elefanti, bisonti e cervidi) ritrovati nelle vicinanze di Pavia; con uno scheletro completo di *Ursus spleaeus* proveniente dai dintorni di Laglio (Como) e con un altro di *Ichtyosaurus*. Una parte di questo patrimonio paleontologico è ora esposto nel nuovo Laboratorio di Paleontologia e Stratigrafia a supporto delle esigenze didattiche. Dopo una parte introduttiva dedicata ai processi di fossilizzazione, in una serie di vetrine sono esposti fossili del Permo-Carbonifero del Sudalpino raccolti durante le ricerche condotte "storicamente" dai geologi e paleontologi dell'Ateneo pavese; del Triassico del Sudalpino e di vertebrati del Quaternario padano. Inoltre sono esposti fossili d'importanza scientifica internazionale fra cui il lectotipo di *Bison priscus*. Lo scopo principale è la realizzazione di un'ostensione moderna sia per gli studenti universitari sia per quelli delle scuole medie, anche nell'ambito del Progetto Lauree Scientifiche cui i Corsi di Laurea in Scienze Geologiche e Scienze Naturali afferiscono.

THE TEETH OF CAVE BEARS FROM VALSOLDA (LOMBARDY, NORTH ITALY): AN HYPOTHESIS OF THEIR EVOLUTIONARY LEVEL

Santi G.[1], Rossi M.[2]

[1] Dipartimento di Scienze della Terra e dell'Ambiente Università di Pavia, Via Ferrata 1, I-27100 Pavia, Italy;
[2] Museo Civico di Storia Naturale, Lungadige di Porta Vittoria 9, I-37100 Verona, Italy.

Valsolda is a locality in the Como province (Lombardy) as of yet unknown for its fossil records of cave bears; despite this, in the past, several remains of cave bears have been gathered and collected. Probably, these fossils were found in the Buco della Noga cave. The teeth have been morphologically and morphodynamically studied in order to place this population into an evolutionary level. From a general point of view, they have a very similar size to those of other populations from North Italy and in Europe; they belong to the *Ursus spelaeus* group, but it remains difficult to individuate the species (*U. ingressus*?, *U. ladinicus*?). In some cases, their size is very similar to that of the small cave bears (*U. deningeri*), but the complexities of their dental surfaces prevents them from being inserted into this species. Also the morphodynamic analyses confirm that the evolutionary level of the Valsolda cave bears is in general medium and in some case rather low, a typical feature of the bears of the early (?) Late Pleistocene, even if probably, the bears from Valsolda and the alpine caves are chronologically younger than this period of time. On the contrary (i.e. for M^2), higher morphodynamic indices have been found, but only in a few specimens; this can probably be attributed to intraspecific variation. From a general point of view, in North Italy the populations of speleians are very similar in size (generally medium) and in morphodynamic indices. Consequently, a medium evolutionary level is indicated for them, with the exception of the Basura locality (Liguria) in which the cave bear population shows very high morphodynamic indices (the highest of the whole populations in North Italy). In general, for the Basura a problem still exists: why is then this difference in the morphodynamic indices? This at the present time, is a mystery; we have only few data to answer this question, because the chronological and genetic data are missing.

LA PALEONTOLOGIA NEI TESTI SCOLASTICI ITALIANI: PROBLEMATICHE E POSSIBILI SOLUZIONI

Tona D.

corso Rigola 64, I-13100 Vercelli.

Esaminando i programmi ministeriali per l'insegnamento delle scienze nella scuola secondaria di I grado emerge come la paleontologia sia trattata in modo sbrigativo e superficiale, spesso relegata a pochi paragrafi nei libri di testo; questo nonostante i fossili siano ottimi strumenti interdisciplinari che permettono di collegare le scienze della Vita con quelle della Terra, evidenziando il legame tra i processi biologici e quelli geologici come parte di un unico sistema.
I libri di testo spesso riportano informazioni superate, imprecise o addirittura del tutto sbagliate, con la grave conseguenza di trasmettere agli studenti un bagaglio di conoscenze errate con potenziali ripercussioni sulla loro preparazione nei cicli scolastici successivi.
Lo scarso livello qualitativo delle nozioni paleontologiche sui testi scolastici è riconducibile a varie cause, essenzialmente al riutilizzo degli stessi testi per anni senza aggiornarli in accordo con le ricerche più recenti e alla stesura dei contenuti affidata ad autori con specializzazioni in altre discipline e quindi privi della competenza necessaria a redigere testi corretti. Un maggiore riconoscimento della paleontologia dal punto di vista culturale e didattico attraverso un cambiamento dei programmi ministeriali sarebbe auspicabile, incoraggiando le case editrici a produrre testi in cui questa disciplina goda di una trattazione approfondita e aggiornata. Tre possibili soluzioni per garantire una simile qualità sono: far aggiornare i testi allo staff editoriale interno sfruttando la facilità di reperimento delle informazioni permessa dai moderni strumenti di comunicazione; ingaggiare un revisore specialista della materia, che controlli la qualità dei testi e delle immagini; coinvolgere gli esperti direttamente nella stesura dei testi, lasciando quindi che sia un paleontologo a scrivere la parte di paleontologia.
Per rendere più fattibile l'attuazione delle soluzioni proposte occorre facilitare la comunicazione tra le parti e creare un contatto diretto tra editori e università o associazioni come la SPI, cosicché sia più facile coinvolgere persone competenti che migliorino la qualità dei testi e quindi la preparazione degli studenti. Purtroppo è improbabile che ciò possa accadere in tempi brevi, ma si spera che mettere in evidenza queste problematiche possa incoraggiare chi di dovere a intervenire a beneficio dell'apprendimento della paleontologia per le future generazioni.

ANFIBI E RETTILI DEL SITO PALEOANTROPOLOGICO DI VISOGLIANO (PALEOLITICO INFERIORE): DATI PRELIMINARI

Villa A.[1], Boschian G.[2], Tozzi C.[3], Delfino M.[1,4]

[1] Dipartimento di Scienze della Terra, Università degli Studi di Torino, Via Valperga Caluso 35, I-10125 Torino, Italy;
[2] Dipartimento di Biologia, Università di Pisa, Via Derna 1, 56126 Pisa, Italy;
[3] Dipartimento di Civiltà e Forme del Sapere, Via dei Mille 19, 56126 Pisa, Italy;
[4] Institut Català de Paleontologia Miquel Crusafont, Universitat Autònoma de Barcelona, Edifici Z (ICTA-ICP), Carrer de les Columnes s/n, Campus de la UAB, E-08193 Cerdanyola del Valles, Barcelona, Spain.

Il riparo di Visogliano è considerato un importante sito paleoantropologico, per via del ritrovamento di resti umani datati al Pleistocene Medio insieme a industria litica su scheggia del Paleolitico inferiore. Oltre ai resti umani, manufatti litici, sedimenti, pollini e resti faunistici sono già stati soggetto di analisi specifiche. Queste ultime hanno indicato che i livelli fossiliferi si sono depositati durante una fase interglaciale e una o due fasi glaciali, nel complesso datate a un intervallo di tempo compreso tra 500.000 e 350.000 anni fa. Tuttavia, per quanto riguarda i resti di vertebrati non umani, solo i mammiferi sono stati studiati finora.
Questo lavoro si concentra, per la prima volta, sugli anfibi e i rettili raccolti tramite la setacciatura ad acqua dei sedimenti provenienti dal riparo. L'analisi è da ritenersi preliminare, in quanto solo i resti recuperati tra il 1992 e il 2000 sono stati finora studiati. Il materiale qui considerato comprende complessivamente 1305 fossili.
L'erpetofauna include almeno quattro anfibi (un caudato indeterminato, *Bufotes* gr. *B. viridis*, *Pelophylax* sp., *Rana* sp.) e almeno sette rettili (*Testudo hermanni*, *Anguis* gr. *A*. *fragilis*, un lacertide di grande taglia e uno di piccola taglia, "Colubrines" indeterminati, *Natrix* sp., *Vipera* gr. *V*. *aspis*). Di notevole interesse è il fatto che tutti i taxa riconosciuti siano ancora presenti in Italia nordorientale. Ciò supporta l'ipotesi di una moderna erpetofauna già in fase di formazione nell'area fin dall'inizio del Pleistocene, come recentemente riportato da altri lavori. Da segnalare anche l'assenza di *Pseudopus*, identificato in altri siti del Pleistocene Medio (e anche Superiore) in Veneto.

PALAEOECOLOGY OF LOWER PERMIAN BRACHIOPODS FROM THE QARARI UNIT, OMAN

Viaretti M.[1], Angiolini L.[1], Heward A.[2]

[1] Dipartimento di Scienze della Terra 'A. Desio', Università degli Studi di Milano, via Mangiagalli, 34, 20133, Milano;
[2] Croftdown Court, Malvern, WR14 3HZ, UK.

Here, we present a palaeoecological analysis based on 193 fossil brachiopods from marly limestones of the Lower to Middle Permian Qarari Unit of the Sultanate of Oman. The Qarari Unit is the oldest unit of the allochthonous Batain Group, which has an age ranging from the Lower-Middle Permian to the Upper Cretaceous, and it is covered by Quaternary sediments.
The brachiopod fauna comprises 29 genera: *Neochonetes*, *Retimarginifera*, *Calliprotonia*, *Juresania*, *Bilotina*, *Waagenoconcha*, *Derbyia*, *Perigeyerella*, *Goniarina*, *Rhipidomella*, *Parenteletes*, *Acosarina*, *Orthotichia*, *Stenoscisma*, *Goleomixa*, *Cleiothyridina*, *Posicomta*, *Hustedia*, *Martinia*, *Purdonella*, *Spiriferella*, *Arcullina*, *Tipispirifer*, *Squamularia, Permophricodothyris*, *Paraspiriferina*, *Callispirina*, *Spiriferellina* and *Hunzina.*
This analysis considers the taphonomical features of the specimens, in particular, the degree of corrasion, fractures, bio-erosion and bio-incrustation, their dimensions and their life-style, derived from their morphology. Some shells show traces of biotic interactions - most of them are bryozoans fouling - and traces of predation by gastropods.
We observed that brachiopod species reached a different sizes based on the effectiveness of the filtration process - linked to the type of lophophore (and the brachidium) - and on the nutrient supply that was therefore variable. Also, the shell shape of the brachiopod species reveals the variability of environments and niches: concave-convex shells were adapted to soft fine grained substrates, whereas epifaunal pediculate brachiopods were thriving on firm substrates, like crinoids shoals or hardgrounds.
Based on these features, the palaeocommunity is considered autochthonous, and adapted to carbonate shelf settings at depth below the normal wave base, characterized by mixed, loose, fine-grained to locally coarse and firm sediments, with bioclastic shoals mostly made of crinoid fragments.

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